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Maintenance of Rolling Stock

on New England Railroads

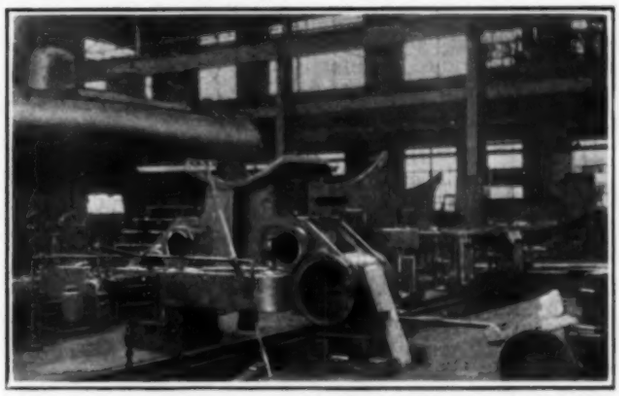


Fig. 1—Building a new locomotive

By Ellsworth Sheldon

New England Editor, *American Machinist*

The Rutland Railroad of Vermont—Shops and practices at Rutland—Bronze replaces cast iron and steel in some parts

AMONG the early railroads of New England is one that was projected about the middle of the last century to cut diagonally across the State of Vermont from Brattleboro to Burlington, passing through the city of Rutland. The name under which it was first incorporated was the Connecticut River & Lake Champlain Railroad, and, unlike not a few of the pretentious projects of that early day, it aimed actually to connect the terminals indicated by its name.

About the same time, in 1852 to be exact, another road, called the Bennington & Rutland, was being built to connect those two towns, 57 miles apart. The C. R. & L. C., passing through the financial turmoil not entirely disassociated with pioneer work in railroading, finally emerged as the Rutland Railroad, running not from Brattleboro but from Bellows Falls to Burlington, and later extended through the islands of the lake to Alburgh.

The "reorganization" in some way managed to include the Bennington & Rutland, an already going concern, so that the Rutland road of today connects the northwestern with the southwestern corners of Vermont, swinging toward the middle of the State in its passage and branching at Rutland to Bellows Falls on the Connecticut River; at which point it connects with other roads to give it an outlet toward Boston and to Southern New England. Connections established at a later period give it an outlet on the north to Malone, and on the south to Troy, New York. Its main shops are located at Rutland, Vermont, where all of the general and classified repairs upon the motive power are taken care of.

The Rutland shops are quite modern in construction, the car shops especially having but recently been completed, and take the place of an older building dating from the beginning of the road that previously housed all the machinery of repair. The old building is still used for freight car work, and contains also the mill from which all the wood work is gotten out.

The locomotive and the boiler shops are on opposite sides of the pit of a transfer table that thus serves both shops. The buildings are of brick, steel and glass construction, giving ample light and ventilation to the erecting floor, which is served by a 30-ton electrically driven bridge crane.

Location of the Machine Tools

The larger machine tools are on the main floor of the erecting shop immediately adjacent to the tracks, so that they also may be served by the crane. Some of the smaller ones are in a bay opening from the main shop and extend back toward the blacksmith shop. A gallery, extending over a part of the main floor, provides space for the air-brake department and the tinsmith's quarters. The equipment, though not wholly modern, is good, and includes some of the latest machinery for railroad work.

The oxy-acetylene torch plays an important part in this, as in most modern railroad shops, and there is a newly installed acetylene generating plant to supply this gas, which, with the oxygen, is piped to all parts of the shops and yards where it can be used. The gas house is located at some distance from the other buildings to minimize the danger from fire.

Besides the regular and classified repairs with which a locomotive shop is always occupied, this one is now building an engine which, though it will contain many parts taken from other engines, will be practically a new machine. This is shown in Fig. 1, with the scrapped engine it is to replace just beyond it. The frames and saddles are new, a new boiler is being made for it, and many of the minor parts will be new.

Though it cannot ordinarily be considered profitable for a railroad to build its own new equipment, there is in this connection a factor that is often overlooked. Few machine shops—and no railroad shops—can reasonably expect a steady and uniform flow of work at all times, and in order to handle the "peak-loads" that will inevitably occur, often at the most inopportune moments, the force employed must of necessity be greater than would be required to handle the same

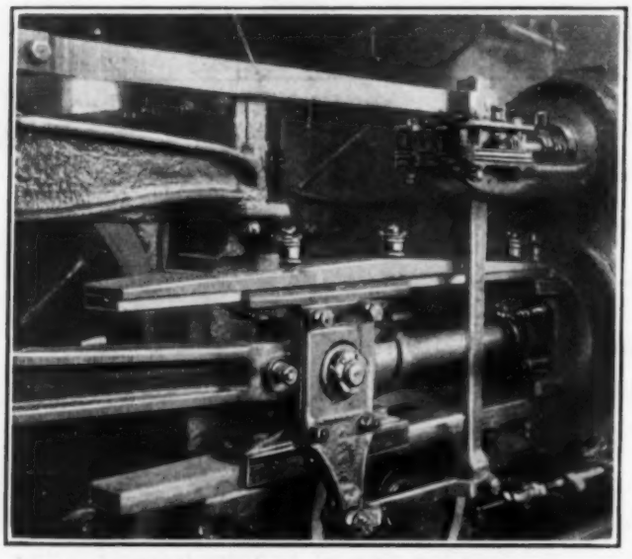


Fig. 2—Guides and shoes resurfaced with bronze

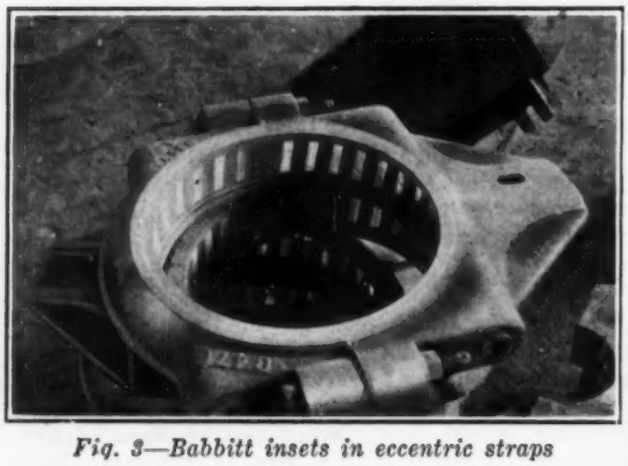


Fig. 3—Babbitt insets in eccentric straps

total volume of work were the latter to be ironed out and spread over a long period.

No shop can at a moment's notice hire on a gang of skilled men to take care of some emergency job, fire them next week when the job is finished, and expect to hire them back again when, after a couple of months or so, the next peak comes along. In order to have somewhere near the peak load capacity in men always on hand to meet an emergency, and to keep them usefully employed in slack intervals, every shop must have

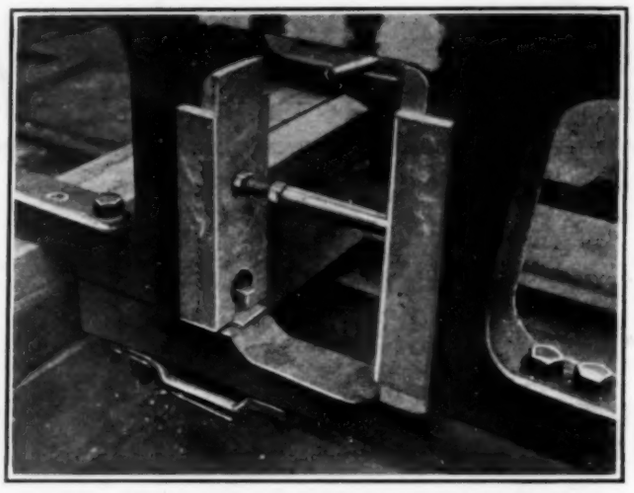


Fig. 4—Bronze shoes and wedges for driving boxes

a job or jobs upon which there is no time limit; jobs that can be dropped, instanter, and taken up again when convenient. In the old days we used to call such jobs "knitting work"; and the new engine mentioned above may be considered as knitting work.

Building up worn cross-head guides with steel is quiet common practice in railroad shops. Building them up with manganese bronze is less common. Building up both guides and crosshead shoes with manganese bronze may be looked upon as an experiment; yet that is what has been done on the engine shown in Fig. 2. Guides resurfaced with bronze are said to wear better than when steel is used, but the combination of bronze on bronze has not been in service long enough to reach a decision. Note the extra depth of flange on the lower shoe to resist lateral wear.

In Fig. 3 is shown a set of eccentric straps that belong to one of the road's large freight engines that still retains the Stevenson gear. These straps are of cast iron, having cored pockets around the bearing surfaces for the reception of babbitt, which is poured and peened into place before machining.

Shoes and wedges of cast iron are liable to breakage. Of cast steel they do not always wear well with the driving box. This road is making shoes and wedges of bronze, as in Fig. 4, and the additional cost of material is said to be far more than compensated by the longer life and freedom from breakage of the parts.

A corner of the blacksmith shop is fitted up as a brass foundry, having the usual floor furnaces and all

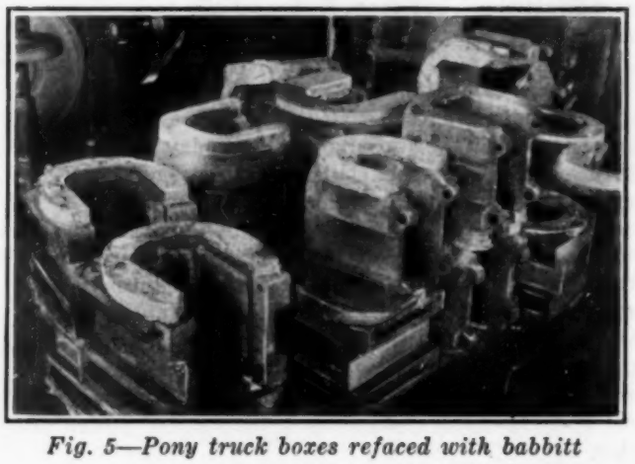


Fig. 5—Pony truck boxes refaced with babbitt

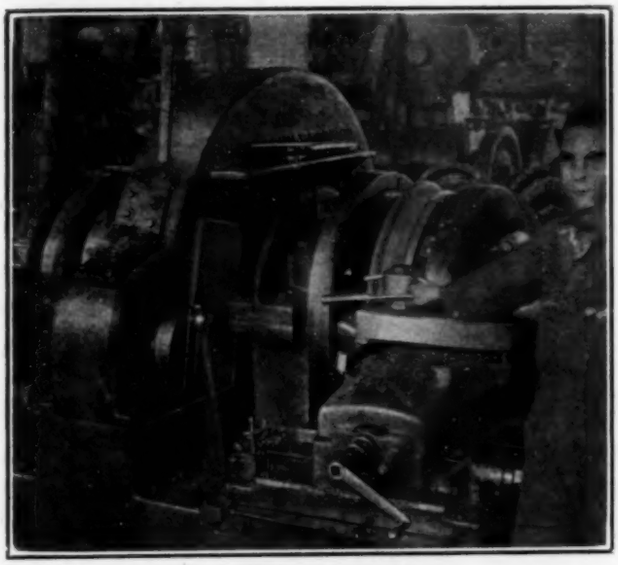


Fig. 6—The wheel lathe

the appurtenances necessary to the molding and casting of brass. Crown brasses are often poured in the driving boxes, and though this method has its disadvantages, it saves a deal of time and labor in fitting. Driving-box facings are poured in the foundry, as are babbitt facings of pony-truck boxes, babbitt linings of car-wheel journal boxes and similar parts.

A pile of pony-truck boxes with newly poured babbitt facings is shown in Fig. 5, where they are waiting for the boring mill operator to get around to them. This, also, is "knitting work," and the operator is never at a loss for a job, for in the intervals between rush work he is sure to find a pile of these parts ready for him.

The wheel lathe, Fig. 6, with the hydraulic forcing presses, car-wheel boring mills, axle lathes, etc., is located in the bay between the main erecting floor and the blacksmith shop, where this part of the work can be carried on without interruption, yet be easily available in case of rush jobs from the main floor. The treads of pony-truck and passenger-car wheels are turned here.

Rod-end brasses are planed in a shaper by means of the fixture shown in Fig. 7. A pair of brasses being clamped to the fixture, they may be planed on four sides without the necessity for resetting, and with the certainty that the surfaces will be square. Time is thus saved in setting up, and the possibility of error eliminated by the indexing feature of the fixture.

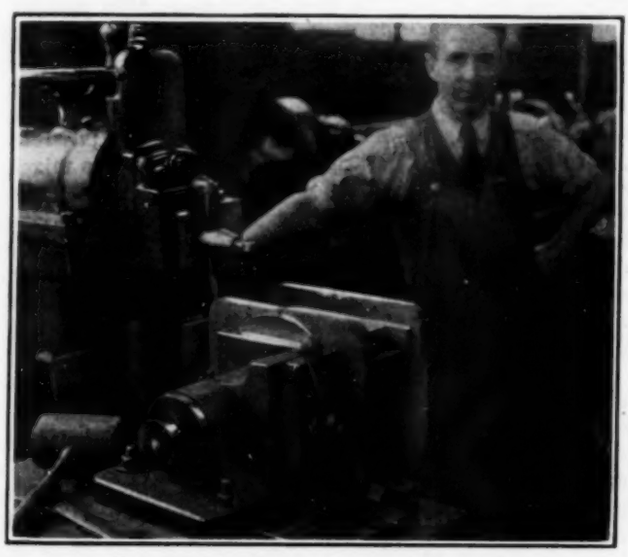


Fig. 7—Fixture to plane rod brasses

In Fig. 8 is shown the application of a "squaring gage" made up of standard Brown & Sharpe tool parts. Instead of using a plumb bob or pendulum this tool employs a level glass, set in the swiveling member. The vernier graduations enable the user to gage the settings of the crankpins very accurately. This device was evolved by the General Foreman of the Rutland shops, Mr. W. S. Clark, who is shown with the device in the illustration. He said he got the idea from the *American Machinist*.

An expedient that the writer had not seen in other

Fig. 8—Tool for "squaring" the crank-pins

Fig. 9—Norton jack driven by air motor

shops was the use of an air motor to manipulate a standard Norton locomotive jack. Instead of a slow-operating ratchet or other wrench, a special socket is made as may be seen in Fig. 9 to connect the motor to the jack, so that the latter can be handled by one man at a great saving in time and labor. The air motor may again be seen in Fig. 10, where it is shown furnishing the power to drive a cylinder boring rig; a common application in railroad shops.

Grinding is not practiced to the extent that it should

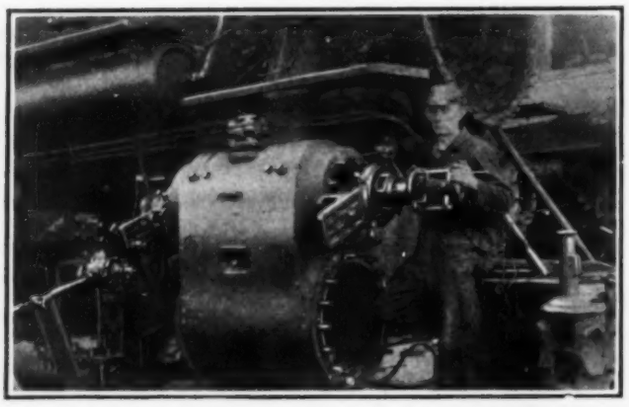


Fig. 10—The portable boring rig with air motor

be, considering its possibilities in the way of rapid and exact sizing of round parts. Though the shop is equipped with a standard cylindrical grinding machine of modern design, valve and piston rods, that could be finished better and more quickly by its aid are still made in the old way upon a lathe. A link grinding machine is, however, in reasonably continuous service, grinding links and blocks that have been built up with the electric welding arc.

A Makeshift Grinder

An improvised surface grinding machine, shown in Fig. 11, has been made out of an old but still serviceable iron planer. No alterations were made to the machine except to provide a suitable mounting with bearings for the wheel spindle in place of the original vertical slide, and to attach a bracket to the saddle. A small electric motor mounted on this bracket drives the wheel spindle by a quarter-turn belt.

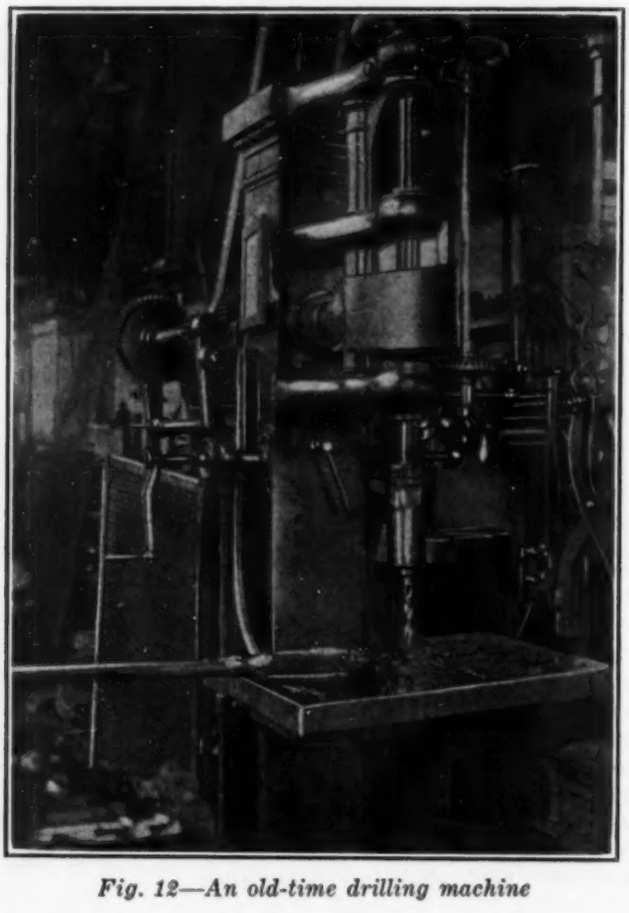


Fig. 12—An old-time drilling machine

To prove that a machine is not necessarily a time-wasting device just because it happens to have been built before the war, the drill press, Fig. 12, is here shown. No name or other inscription could be found upon it to indicate its age or origin, but it is known to have been in service since 1860 or earlier. It is a strong, sturdy machine with ample power for its capacity and a wide range of speeds. It is the special pride of a helper who has been detailed to run and take care of it, and he keeps it busy during his otherwise spare moments in drilling the multitude of small parts that fall to the lot of such a machine.

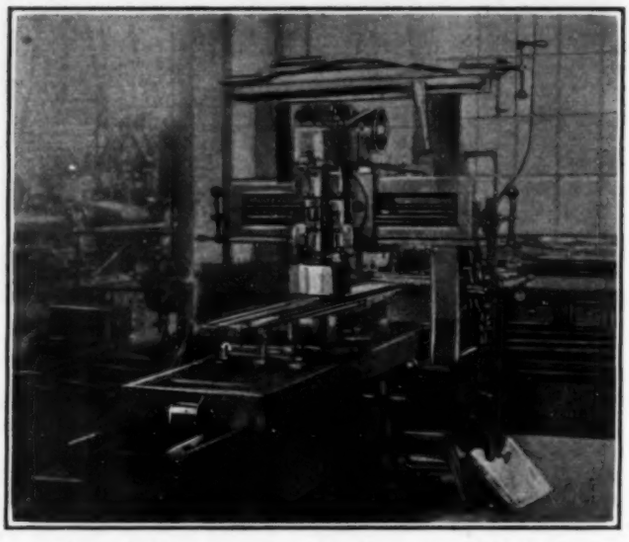


Fig. 11—Planer converted to surface grinding

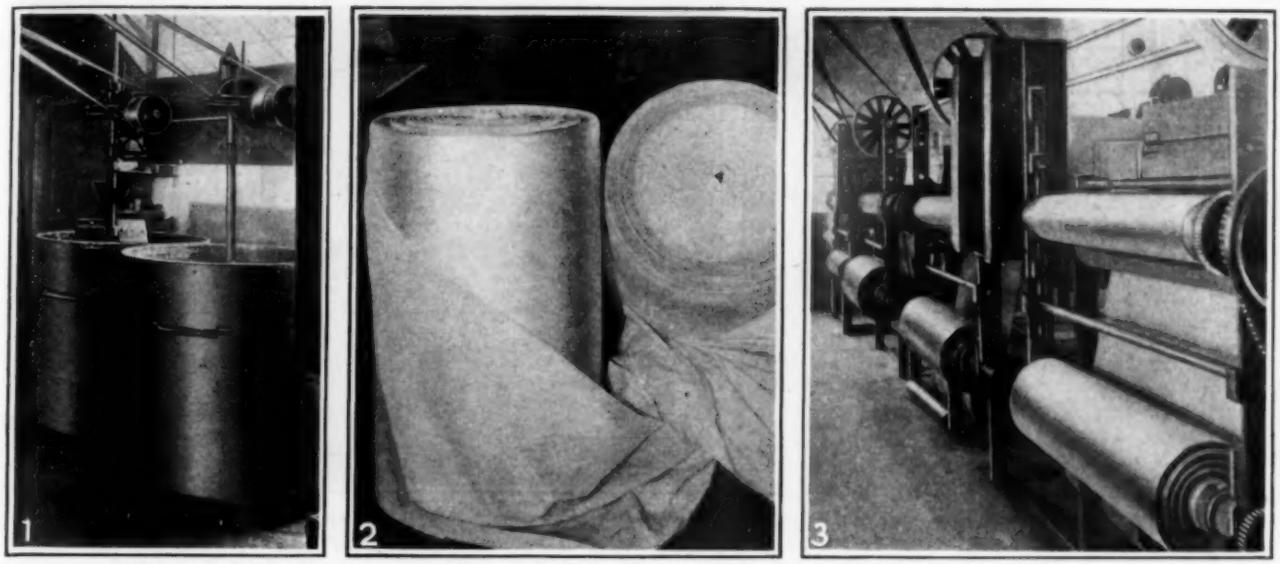
Prolonging the Life of the Pickling Tanks

Tanks used in connection with the operation of pickling mill scale from sheet steel usually receive rough usage. They are specially constructed for the purpose but their average life is comparatively short. Usually, the first signs of trouble will be on the bottom where seams open up between the timbers and the sulphuric-acid solution begins to leak through. This leakage spells disaster for the foundation below unless it is properly protected from attack by the acid.

A remedy was found for this trouble that, while temporary at best, could be used to keep the tanks in service longer than would otherwise have been possible.

Ordinary tar and high-melting-point pitch was mixed in equal amounts, melted and poured over the bottom to a thickness of about two inches, after batten strips had been laid lengthwise of the planks but clear of the cracks. A thin flooring was then laid over the tar and secured to the strips with monel nails. On the ends a bulkhead was built about two in. outside of the end planks and filled with the mixture.

When the tank was heated, a scum formed at the surface until the volatile oils had been heated out of the mixture. This scum was removed, as it formed, until no more appeared. The tar ran into the cracks and gradually through them to leak out but the acid leaks were stopped. The tar was replenished about once a month and the average life of the tanks prolonged considerably.



1—Mixing the Bakelite compound. 2—The duck used as a base. 3—Treating the duck with Bakelite

Making and Testing Material for Non-Metallic Gears

By Fred H. Colvin
Editor, *American Machinist*

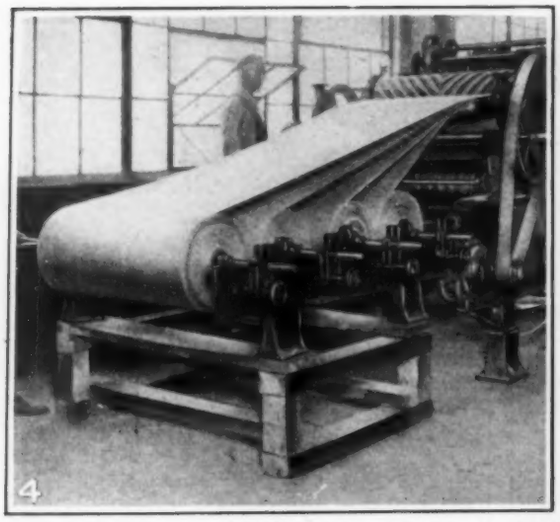
The steps by which fabric is impregnated with a suitable compound and made into material for gears adapted to many uses

THE growing use of non-metallic gears, makes both the material and the method of producing them of interest to the man who makes and uses gears. The advantages are the elimination or reduction of noise and the resiliency, or cushioning effect, of the non-metallic material. Since many gear materials with different trade names are made with the same compound, Bakelite, the methods shown herewith, from the plant of the Formica Insulation Co., Cincinnati, Ohio, are typical of the most modern practice in this field.

The greatest care is necessary to secure uniformity of product, since Redmanol or Bakelite binders are subject to chemical reaction after they are mixed. For best results, this reaction, or aging, should reach a certain degree before the material is used. In order to control this factor, the Formica Co. mixes all its own binder, a portion of the mixing room being shown in Fig. 1. Tests are made at frequent intervals to insure a uniform product.

In making material for gears or other uses requiring strength, the nature of the fabric to be impregnated is of great importance. For this reason the duck used is of carefully selected material, coming to the plant in rolls, as in Fig. 2. The rolls of duck go to the impregnating machines, a double row being shown in Fig. 3. The tanks holding the impregnating compound are at the other end and means are provided so that a predetermined amount of Bakelite will be taken up by the duck as it passes through the machines. Too much of the compound makes the material brittle, while too little is equally undesirable for best results. Just the right combination gives a material that will stand both wear and impact to a remarkable degree.

After being suitably dipped and dried, the duck comes to the machine shown in Fig. 4, to be cut into 36-in. squares. The feeding device permits four rolls to be handled at once, so that the machine cuts four sheets at each revolution of the knife. From here the square sheets go to the vulcanizing department where they are first piled, as in Fig. 5, and then vulcanized in the steam presses shown in Fig. 6. In order to secure a smooth surface and uniform thickness a metal plate is placed between each batch of sheets, the number of sheets in the batch depending on the thickness desired in the finished sheet. For ordinary sheets, in which a special finish is not necessary, iron or steel plates are used between each batch. But when a high finish is wanted, copper plates are used, and they receive most careful attention. Since every scratch on the plates is transfered to the material being vulcanized, great care is taken to have the copper plates carefully polished and burnished, with the result that the surface of the finished sheets have what is practically a mirror finish. The burnishing of the copper plates is quite an im-



4—Cutting into squares. 5—Packing sheets for curing. 6—Steam curing presses

portant part of the work, requiring great care and skill.

The way in which sheets are cured is seen in Fig. 6. The batches of sheets are put between the movable steam tables or "packs" that are connected by the links shown. With the sheets in place the packs are brought together by hydraulic pressure until the desired thickness is secured. They are then held in this position. Steam is turned on and both the temperature and the pressure are held for the period required for curing. A good idea of the condition of the finished sheets can be had from Fig. 7, in which the highly polished surfaces may be seen.

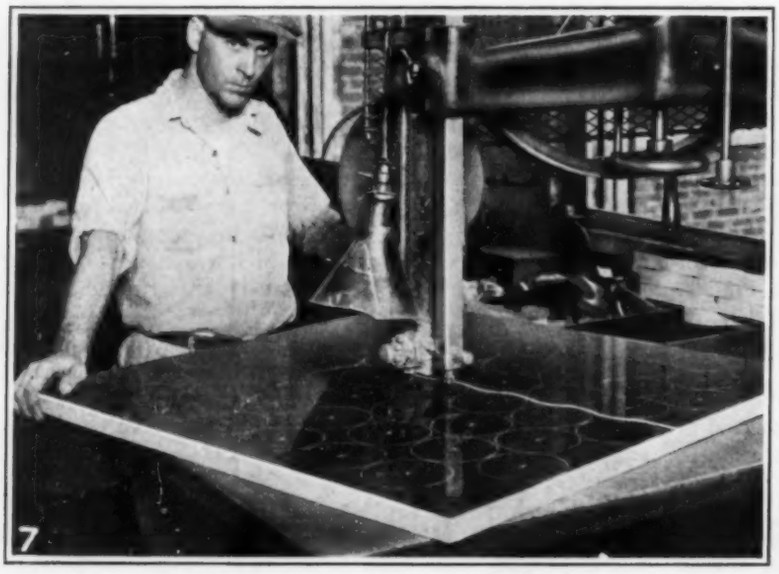
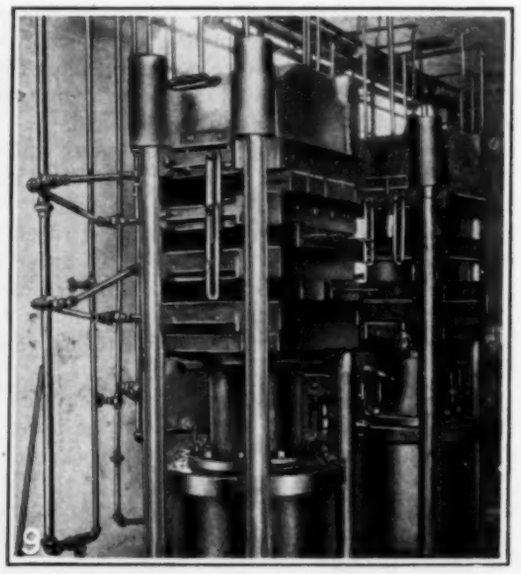
Sheets that are to be used for gearblanks, are usually cut up with a bandsaw, after being marked off as in Fig. 7. By cutting the sheet first into strips having a sinuous outline, it is easy to saw out the individual blanks. Unless there is a regular demand for gears of a given size, it is recommended that the sheet material, rather than the molded blanks, be used as a matter of economy to the gear maker. Any desired size or sizes can be cut from a sheet, while to carry blanks would necessitate tying up a lot of money in stock. And the question of waste is about the same in either case, since the blanks, as shown in Fig. 8, are built up from stampings that are punched out from square sheets.

The method of molding gearblanks is shown in Figs. 8 and 9. The blanks are cut in the form of disks for the web, and of rings for the rim. Smaller rings are used to form the hubs. Rings of each kind are kept on separate mandrels to facilitate assembling into the completed blank. The assembler takes the required number of pieces of each kind and puts them together in proper order, weighing them to secure accuracy.

The rings and disks are then put on the lower part of the mold, *A* Fig. 8. The upper part *B* is then put in place and the outer ring slipped over the assembly as at *C*. At *D* is a blank with a pressed-steel bushing, while at *E* are some of the completed blanks after having been cured.

Gearblanks are cured in much the same way as the sheets, Fig. 9 showing a battery of the presses in which the molds containing the assembled rings and disks have been placed. Here the control of both temperature and pressure, as well as the time the material stays in the press, are under careful control and all three factors are kept within very narrow limits.

In order to know exactly what each type of gear will stand, tests are made under various conditions, two of

7—Sawing gear blanks from sheet. 9—Presses for curing molded gear blanks

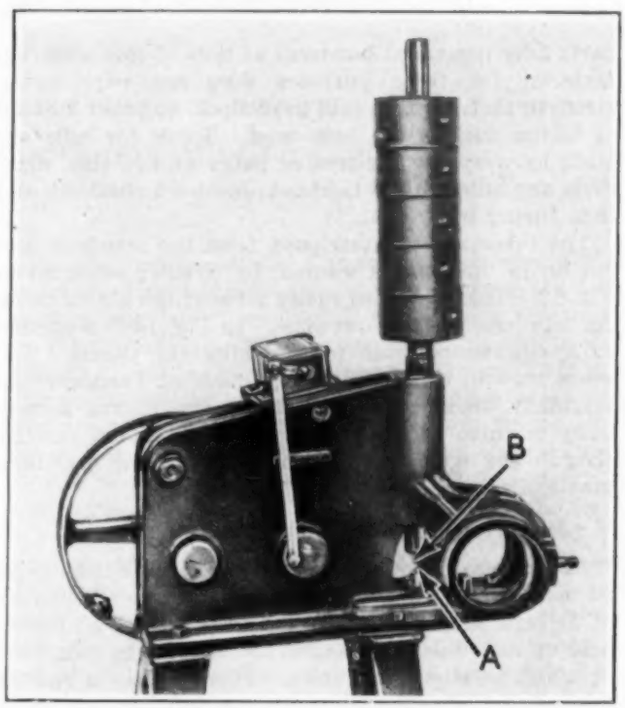
8—Material and molds for gear blanks

the tests being shown in Figs. 10 and 11. In Fig. 10, timing gears are being tested in actual operation on motors running on a test stand, while Fig. 11 shows how timing gears are tested. To simulate running conditions they are so mounted as to receive a 110-lb. blow, 5,000 times a minute. Here they are mounted in suitable tanks containing the oil or liquid with which they are to be tested, and run for any desired length of time. Covers on the tanks prevent the oil from being thrown around the room.

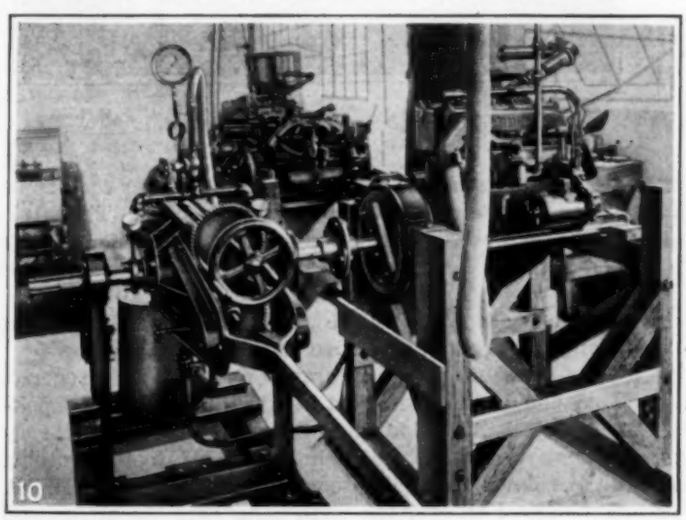
The Impact Test Is Interesting and Shows Surprising Resistance from the Material

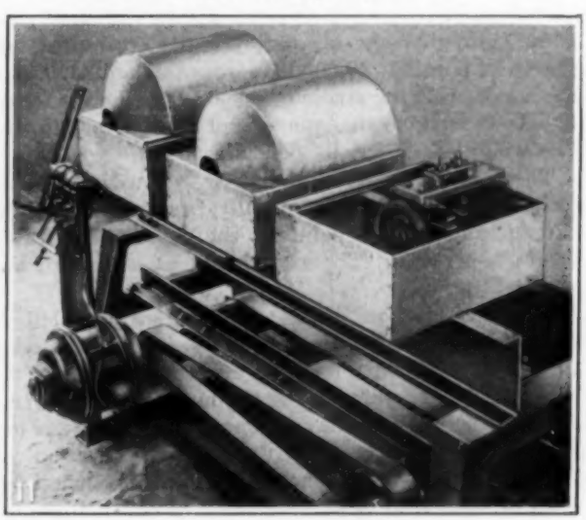
A third test, and a most interesting one to watch, is that of the impact machine shown in Fig. 12. Test pieces, ½ in. square are cut from every batch of gear material, and tested to destruction by 20-lb. blows having a drop of 1⅝ in., struck at the rate of 130 per min. A given number of blows has been established as a standard, and any test piece that falls below this test, entails rejection of the sheet or batch from which it was cut. As a rule, however, the test pieces run far above the standard, and it is surprising to see the amount of punishment they undergo. The test piece is shown at *A* and the hammer at *B*.

Formica is, of course, used for many other purposes than gears. Radio panels, coil tubes, dials and other



12—Impact testing machine





10—Testing stand for gears under load. 11—Running test for timing gears

13—Cutting up Formica tubes

parts have demanded hundreds of tons of this material. Material for these purposes does not require the strength that must go into gear stock, so paper instead of cotton duck is the base used. Tubes for coils are made by wrapping the treated paper around steel mandrels until the desired thickness has been obtained, and then curing it, by heat.

The tubes are then stripped from the mandrels and cut up in the lengths wanted, by circular saws, as in Fig. 13. This view also shows some of the sheets being cut into panels of various sizes. In Fig. 14 is a portion of a sanding machine for finishing the panels. The gears used in this machine are made of Formica. As originally made with all metal gears, it was a very noisy machine and most annoying to the workers. By substituting gears of Formica the noise has been practically eliminated.

Physical Characteristics of Formica

Aside from the quietness and resiliency, Formica can be machined readily and smoothly; is not affected by oil at high temperatures; is insoluble, infusible; resists heat up to 250 deg. F.; and is not affected by most acid or alkali solutions or fumes. Formica has a specific gravity of 1.38; expands 0.00002 in. per deg. C. (about twice that of cast iron); has a tensile strength of 11,500 lb. per sq.in in both directions across the sheet; takes 2,700 lb. to tear sheets apart; stands a compression of 24,500 lb. parallel; 47,000 lb. across the laminations, and has a safe working stress of 6,000 in the Lewis formula. The sheets are 36 in. square, and from $\frac{1}{4}$ to 4 in. thick. The weight is 0.0495 lb. per cubic inch.

The material can be sawed or cut with trepanning tools, but the former is usually preferred. A saw of 21 gage and with $3\frac{1}{2}$ points to the inch is used, running 5,000 ft. per min. The saw should have a set of $\frac{3}{64}$ in., and be kept sharp.

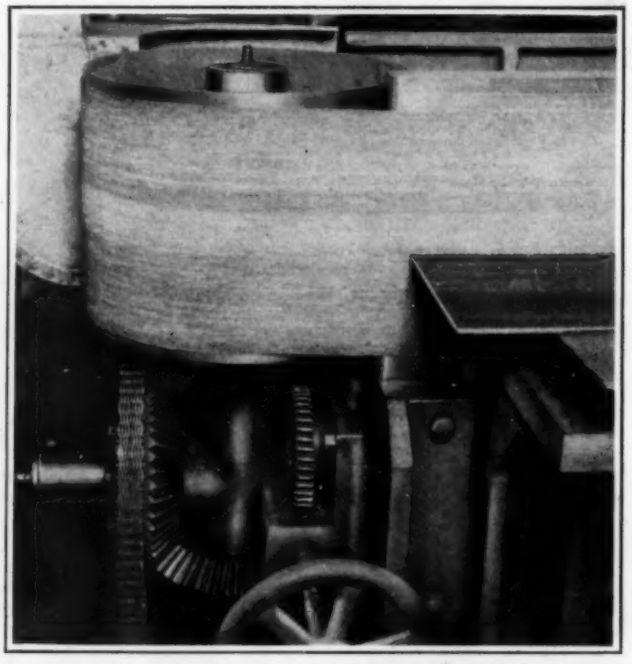
Ordinary carbon drills are recommended but they must be kept sharp. In some cases, it may be advisable to grind the points slightly off-center to clear themselves, instead of binding as the material heats. In any case, the points must have a longer taper than for metal. This is particularly true if the holes are at all deep. A high spindle-speed should be used for small holes, with a rapid feed to prevent heating and binding. For larger holes use slow speed and a lubricant. The tools for all operations must be kept clear of chips. In reaming, the speed should not be too fast but the feed should be rapid enough to ream a 2-in. hole in 5 sec., including both entry and exit of reamer.

For turning, the tools must be kept sharp and have from 3 to 5 deg. more rake than for metal. A cutting speed of 750 ft. per min. can be maintained with a cut of from $\frac{1}{16}$ to $\frac{1}{8}$ in. in depth. A feed of 0.010 in. per revolution is recommended, regardless of the depth of cut.

How to Cut Gears

Gear cutters or hobs should be run at 100 to 110 r.p.m., with a feed of from 0.023 to 0.040 in per rev. As with any material of this kind, there should be a backing-up plate behind the back side of the gear where the cutter breaks through, whether the gears are cut singly or in gangs, to prevent the fraying or breaking out of the material. These backing plates can be made from hard wood or a metal plate can be used and set so as to have the cuts come opposite the spaces to be cut in the gears.

For punching Formica, dies very similar to those used for punching sheet metal are used. Great care should be taken, however, to insure a minimum clearance between punches and dies; it is essential also to maintain



14—A bevel gear application

dies and punches in a sharp condition. Either compound or follow-up dies may be satisfactorily used. The stock should be heated immediately before punching. Heating can best be done on a hot plate placed beside the operator at the punch press. Thin material should be heated to about 250 deg. F., and heavier thicknesses to about 300 deg. F., to insure smooth edges.

Gears should be cut accurately and installed properly. They should have sufficient backlash to allow for expansion due to heat, for the oil film, and for diametrical-bearing clearance. Wedging destroys tooth contour, breaks down the Bakelite and spreads the fabric. A flow of cool oil over the teeth helps both the action and the life of the gears.

Automotive Production

Machining the Transmission Case of the Mack Truck and Bus

By Frank W. Curtis
Associate Editor, *American Machinist*

Inspection of rough castings—Limits of accuracy required—Variety of milling operations—Boring of shaft holes in one setting — Unusual types of trunnion jigs

IN THE past few years, transportation methods have made a noticeable change toward automotive power for solving hauling problems, both freight and passenger, and the increase in demand for trucks and buses has necessitated the adoption of modern production methods resembling those used for the automobile, yet in an individual class on account of the heavy-duty parts that are required. Not long ago a five-ton truck was considered almost impossible, whereas today, this size is referred to as a small unit, the larger sizes running upward to 15-ton capacity.

For many years, the International Motor Co. has been a well-known producer of trucks and buses, operating three plants that are located in Allentown, Pa., and Plainfield and New Brunswick, N. J. The New Brunswick plant is engaged in making transmissions and differentials, and this article deals with the manufacture of the transmission case, while one to be published at a later date will describe the methods of machining the bevel-gear housing. Both of these parts are aluminum castings and require for their completion many unusual operations that have been developed from the experience gained in the manufacture of large power-transmitting units. The castings are made of an analysis that offers strength and yields readily to machining operations. The castings are carefully inspected before they enter the shop and, contrary to usual custom, the laboratory metallurgists work continually in the foundry to check the work as it is produced so that any error is instantly corrected, rather than to have the work proceed into the shop and then trace back any trouble or variations with the result that a batch of useless work is on hand. With each unit is cast a slug or test piece that forms a sample of that individual part. The slug is marked in accordance with the marking on the casting it represents and inspected for analysis that must be correct before the part passes for machining. This procedure is not only an insurance that the casting is made correctly and will stand the strain to which it will be subjected, but also has resulted in the perfection of a method for making aluminum castings that causes little trouble in machining and an exceptionally small amount of scrap.

After the castings are cleaned they are covered on the outside with a coat of blue calsomine; then the inside is sprayed with Xylol, a non-explosive mixture similar in appearance to gasoline, so that cracks, flaws or defects may be quickly detected. Imperfect castings are scrapped. One of the outstanding features of the production methods adopted in the shop is the tolerance to which the work is machined. Accuracy

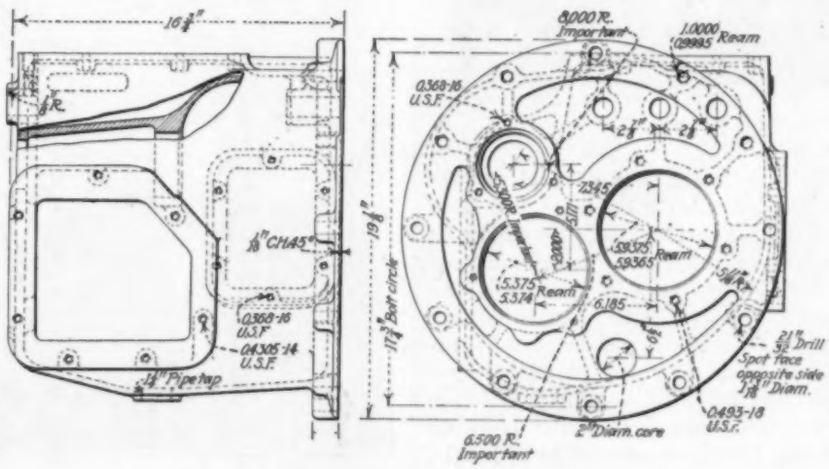


Fig. 1—Part drawing of transmission case

The first part of the article. The second to be published in an early issue.

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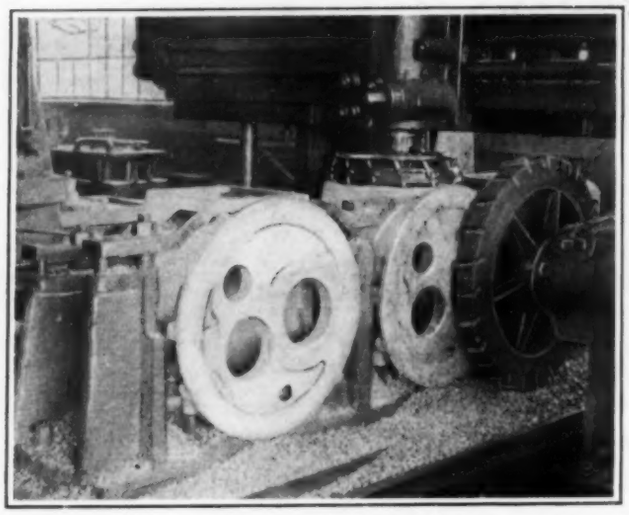

Fig. 2—Milling the top and sides

is considered more important than production, so for this reason, a rigid inspection system is maintained. The drawing of the transmission case, Fig. 1, shows its size and general dimensions.

The first operation performed is the facing of the top and two sides on an Ingersoll milling machine, illustrated in Fig. 2. The fixture used holds three pieces in line, arranged so that eight clamps hold them tightly against locating pins in the lower portion of the fixture. Two pins in each section of the fixture

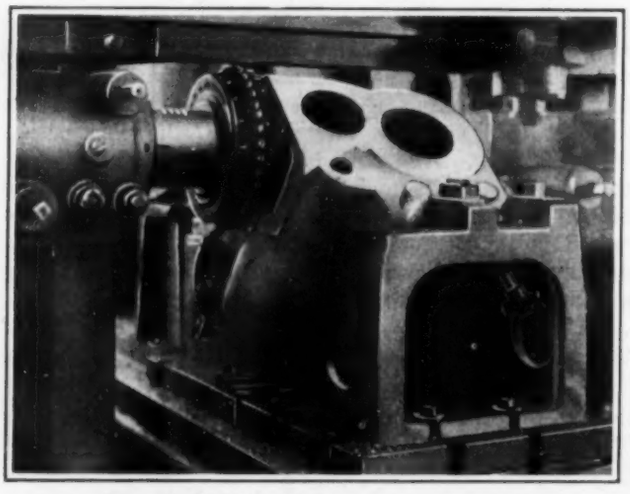

Fig. 3—Milling the two opposite sides

are adjustable so that, with the use of feelers, the work can be properly located. After the work has been rough milled, the cutters are reset and the finishing cut taken on the return travel. The operator places three pieces convenient to the machine, removes the third piece and places a new one in the fixture during the finish-cutting time. One 29-in. and two 12-in. inserted-blade cutters are used, roughing at 225 ft. per min. with a 5½-in. feed and finishing at 225 ft. per min. with a 6-in. feed. A length gage is used for checking the width, while the top face is measured by a height gage from a flat spot on the fixture. In the second operation, Fig. 3, the bottom- and rear-cover pads are faced on an Ingersoll milling machine, the work being located in a fixture so that it is clamped against the previously machined surfaces and held by four clamps. A 10-in. and a 12-in. inserted-blade cutter are used, running at 500 ft. per min. with an 11-in. feed. In this operation the work is machined one at a time.

Milling the front end of the case is the third operation, Fig. 4 showing the set up. The work is clamped on the table of the machine against a locating block. A 14-in. inserted-blade cutter running at 500 ft. per min. with a feed of 12 in. per min. is used. The case

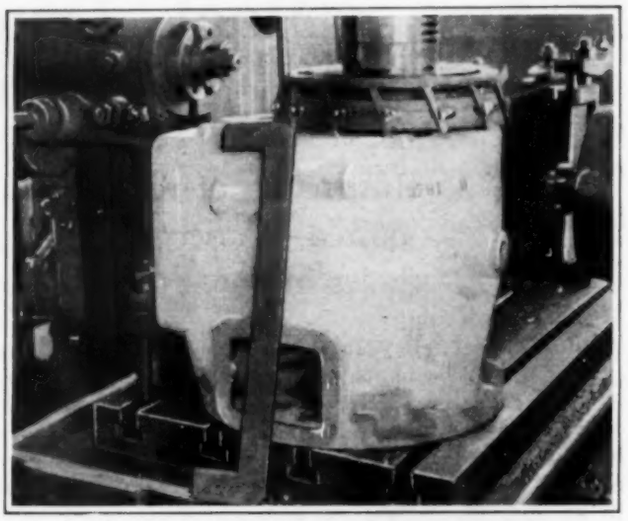

Fig. 4—Milling the front end of case

is finished to 16.750 ± 0.002 in., this size being checked by the length gage shown.

These three operations complete the milling. The next operation is that of boring four holes to 5.9375, 5.375, 3.375 and 2½ in. These holes are bored on a Rockford horizontal drilling machine, shown in Fig. 5. The work is placed in the fixture with a rope hoist and located and clamped from three faces, the large face, the bottom pad (resting on two parallels) and the power

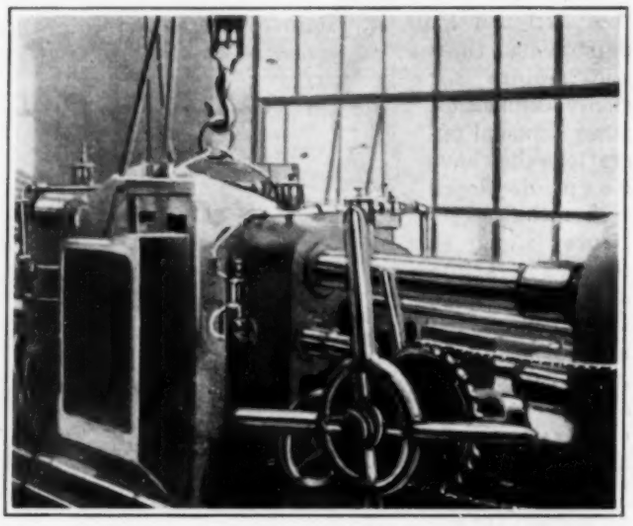

Fig. 5—Boring four shaft holes to size

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take-off pad. Six clamps are used for tightening. The right-hand portion of the fixture is provided with a spur-gear driving unit that operates the various boring bars, a sectional view of which is shown in Fig. 6.

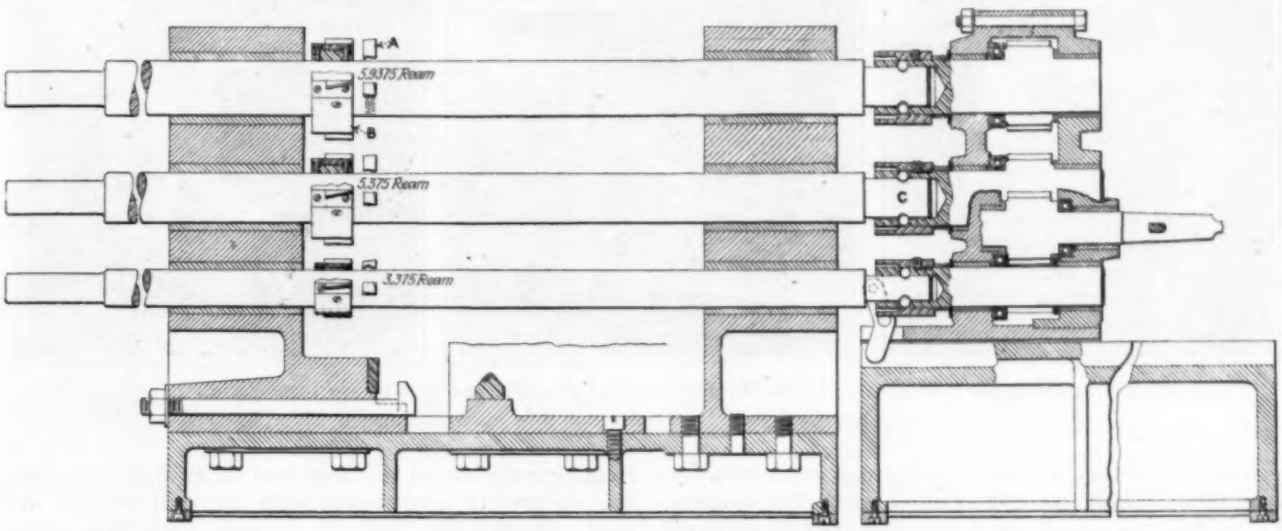

Fig. 6—Details of boring fixture used

Each bar has a roughing cutter *A* and a reaming head *B* for the boring and sizing of the holes.

After the work is located in position, the bar for the 2½-in. hole is drawn through to the driving head, the boring tool set to position and locked by a set screw and the hole bored, leaving 0.01 in. for the reamer that follows. The three larger boring bars are then operated in the same manner. The driving head, shown at *C*, is fashioned after the quick-change chucks, utilizing two balls that locate in corresponding grooves in the bar. Chamfering tools are then used for breaking the corners on one side, 1/8 in. x 45 deg. One side of the 3.375-in. hole is also counterbored to 3 11/16 in. The speed used for boring is 85 ft. per min. with a 0.025-in. feed. The bores are held to ±0.005 in. and must be in line and parallel to within the same limit. The inspection tools used are plug gages, arranged with "go" and "no go" sizes. Extreme accuracy is maintained on this operation because a perfect transmission is largely dependent on the correct position of the holes and their size, and because in most of the succeeding operations the holes are used for location purposes, the alignment depending upon them. Soda-water compound, flooded on the cutting tools, is used.

Drilling Selector-Shaft Holes

The fifth operation, Fig. 7, is the drilling and the reaming of three selector-shaft holes, two of which are 1 in. and one 1¾ in. in diameter. A 24-in. Leland-Gifford drill press, provided with a multiple head of three spindles, is used. The work is located in a trunnion drill jig by the bottom face and by a pilot fitting one of the large bores and clamped by a plug, operated by a handwheel in the upper portion of the jig, that fits in the corresponding bore on the opposite side. The operation is as follows: Place two bushings in the jig and drill two 11/16-in. holes; place two reamer bushings in place and ream to 0.9995-1 in. Place the large center bushing in the jig and drill the 1 41/64-in. hole and ream it to 1.750 ± 0.0005 in. Index the jig and drill and ream the reverse side of the work. The three holes are the same size at both ends. Quick-change chucks are used for driving the drills and reamers. The drill-press head is raised and lowered by an

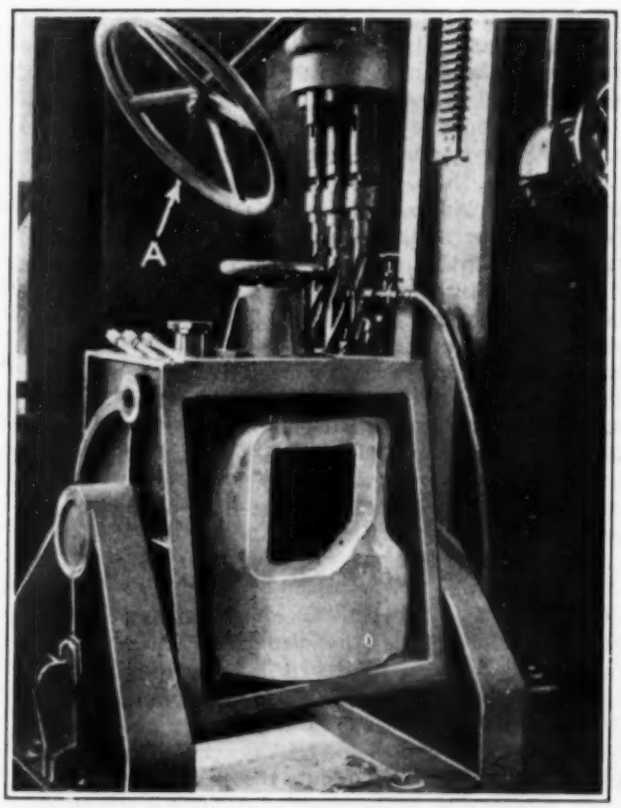

Fig. 7—Jig used for drilling and reaming selector-shaft holes

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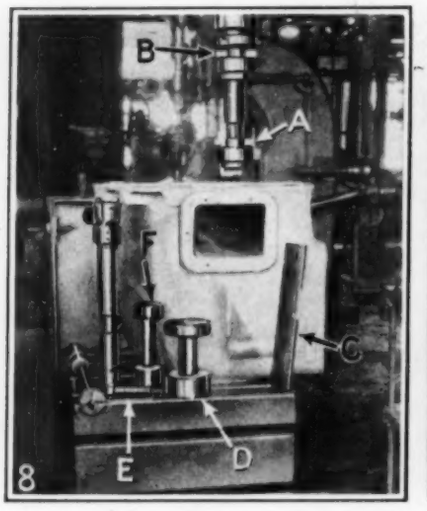

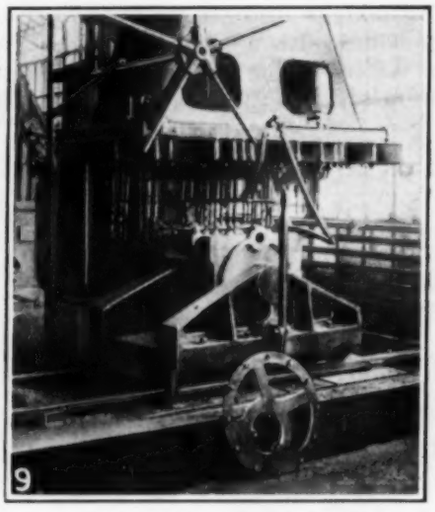

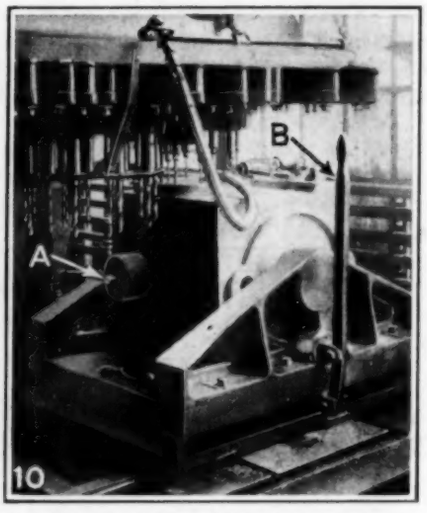

Fig. 8—Set up for reaming 2½-in. hole. Figs. 9 and 10—Trunnion drill jig used for drilling holes in top and bottom, one side and pad

angular handwheel *A* that is situated conveniently for operation. Soda-water compound is used. The reamers are of the expansion type so that they may be adjusted to compensate for wear and produce accurate holes. Plug gages are used for checking the holes. The drills and reamers operate at 225 ft. per min. with a feed of 4½ in. per minute.

At operation 6, Fig. 8, the 2½-in. hole is reamed, the inside face of the 1-in. hole is machined and two counterbores are made on the 3⅜-in. bearing holes to 3¾ in. in diameter and 0.125 ± 0.003-in. deep, being handled on an American radial drill. The work is clamped to the sub-table of the machine by a C-washer and the 2½-in. hole is reamed to 2.499-2.500 in. after which the work is removed from the table and reclamped, opposite end up. The pilot bar is placed in the chuck and brought into the 1-in. hole, then the counterbore is placed on from the inside and the boss is faced to size. The 3¾-in. pilot bar is then placed in the chuck and into the 3⅜-in. hole so that it is in position for counterboring. The lower cutter blade *A* is set in the bar from the inside of the work, the upper blade *B* not requiring removal. The counterboring is finished to the limits mentioned and the work removed from the machine. The bar gage *C* checks the distance between the counterbored holes, *D* is the limit-plug gage for the diameter of the counterbore, *E* is the limit gage for the depth and *F* is the plug gage for the 2½-in. hole. All the cutters of this operation are run at 135 r.p.m. with hand feed.

Large Trunnion Drill Jig

Operation 7 is the drilling of the top and bottom, one side and pad holes, handled on a Natco multiple-spindle drilling machine, shown in Figs. 9 and 10. The case is placed in the open side of the trunnion jig on two locating studs, fitting the large bores, and clamped in position by an upper plug that is operated by a hand-operated crank handle fitting the square end of the screw A, Fig. 10. The open side of the jig in this view is at the bottom.

The jig is mounted on a solid frame that is wheeled from one station to the next and indexed so that the face of the jig corresponds with the drill head to be used. On the left side, six ⅜-in. and three ½-in holes through the bottom of the case are drilled, the center being used for the drilling of 24 holes, including four ⅜-in., six ⅜-in., six ½-in. and eight ⅝-in. holes, through the top of the case and the right-hand side used for drilling eight ½-in. and three ⅝-in. holes in the pad. All the drills run at 80 ft. per min. with a 0.0066-in. feed. The handle *B* is used for locating the index pin after the jig has been turned in the desired position.

The jig revolves on two sets of ball-bearing trunnions, affording an easy-turning motion. The wheels and track for advancing the entire unit are grooved in the rear for keeping the jig in line, and with flat surfaces in front. Fig. 11 shows the details of construction of the trunnion jig. The bottom locating studs are shown

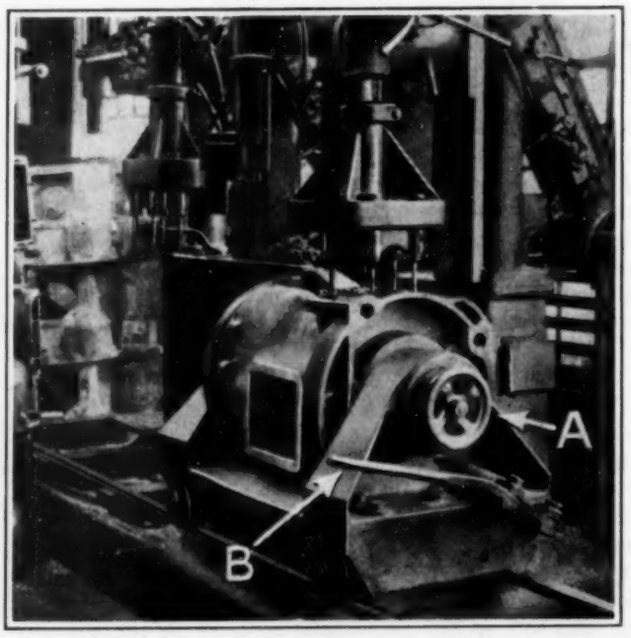

Fig. 12—Jig used for drilling pad holes

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at *A* and *B* and the upper plug at *C*. The ball-bearing trunnion construction is shown at *D*, and at *E* is shown the axle mounting, also of ball-bearing construction. In order to maintain accuracy, it is necessary to have a snug fit between the work and locating studs, sometimes causing the work to bind upon removal. To overcome binding, cam ejectors, operated through bevel gears, are used. The handle *G* is turned to transmit motion to the shaft *H* that operates the cams *J*. In turn the cross-shaft *L* operates a similar set of cams on the opposite side of the fixture. In this way no trouble is experienced in removing the work, as an equalized pressure on four corners quickly loosens it. This operation offers a satisfactory means of drilling the majority of holes in one setting so that they are in correct location and in line with each other. Soda water is flooded on the drills as a coolant and cutting compound.

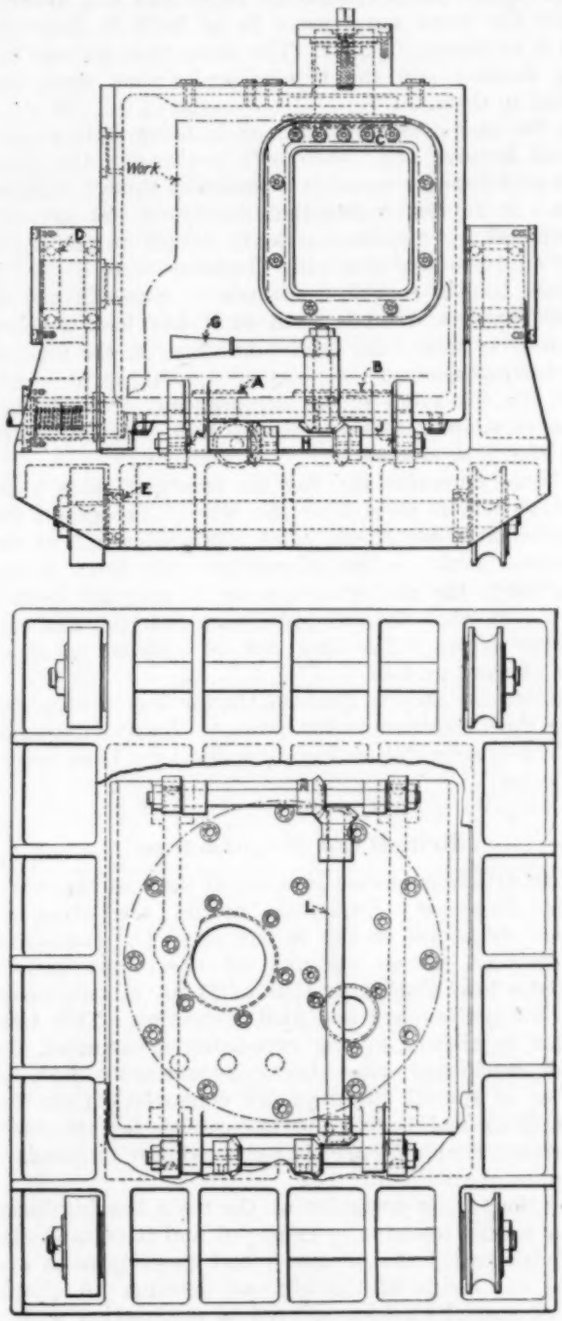

Fig. 11—Details of the trunnion jig shown in Figs. 9 and 10

The next operation is the drilling of the pad holes, seven $\frac{11}{32}$-in. and six $\frac{11}{64}$-in., on a Barnes four-spindle drill, of which only two spindles are used, these being equipped with multiple-spindle heads as shown in Fig. 12. The work, held in a trunnion drill-jig, is located in a manner similar to that used in the preceding operation, and clamped by the handwheel at *A*. The lever *B* operates the locating plunger for indexing the cradle of the jig. The drills run at 60 ft. per min. with a 0.012-in. feed, cooled by a soda-water lubricant.

(To be continued)

Perforating Frame Parts Before Forming

The average conception of the problem of building an automobile frame is that it amounts principally to blanking and then forming the side-members and the various cross-ties. Few appreciate the fact that the perforating is often much harder to perform and an operation that without specialized tools requires many more men than blanking and forming put together.

When frames were first made from pressed steel the suggestion of perforating all of the holes in a side-rail blank before it was formed would have elicited the opinion that the man making the suggestion was little short of crazy or, at least, a bit queer.

Now it is common practice to blank the rail and then set the blanks in the perforating tool and punch out all of the holes at one hit before the forming operation. There are often a hundred or more holes in each blank.

Naturally the draw of the steel in the forming operation will have an effect on the final location of holes in the flanges with respect to the web. Experience has shown that the amount these holes will draw is dependent on the peculiarities of the set of forming tools, on the physical characteristics of the run of steel and on the methods used in the operation to blank-hold the work so side slip cannot occur.

It is therefore not possible to set up any hard and fast rules to go by. This result, together with the uncertainties of new pressed-steel forming operations, has been to create the operation known as "tryout" and delegate the duties of finding causes and recommending remedies to the "tryout man."

On holes not too close to a bend, the proper position in the blank for the flange positions can be estimated from the known formulas for stretch around a bend. When the holes are near a compound draw at a change of shape from a straight channel the known rules no longer hold and the cut-and-try method has to be used. It is surprising how close an experienced tryout man can come on his first guess.

When holes are near an edge in a section that undergoes considerable stretch, judgment must be used as to whether the holes should be omitted due to the danger of splitting or tearing. When proper precautions are taken, however, there will be very few holes that cannot be brought to within a $\frac{1}{64}$-in. limit.

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At the Ford Airport

BY FRANK C. HUDSON

TO THOSE of us who have followed the airplane game since its early stages, the things that impress us most on visiting the Ford airport at Dearborn, Mich., are orderliness and punctuality. The field is already like the over-quoted billiard table, so far as practical surface conditions are concerned. But no less than ten Fordson tractors were busy in the outskirts of the field, leveling and smoothing out the slight undulations. When noon came, all ten were wheeled up into line, instead of being left in straggling positions in the field. In the same way the all-metal Stout planes were lined up in front of the office, awaiting their time of departure.

This "time of departure" was even more of an eye-opener than the orderliness. In the early days, with low-powered planes and much less experience in flying, the time of departure depended on many things. First was the weather—and it only took a slight breeze to keep a machine on the ground. But besides this there was a general uncertainty and a multitude of last-minute details that delayed the flight interminably at times. It is no exaggeration to say that hours meant little in those days for I have known a flight to be scheduled for 10 a.m. and finally get into the air about 4 in the afternoon.

KEEPING TO SCHEDULE

This recollection made it all the more interesting to see the Ford ships warm up their motors and taxi up the field to the starting point in plenty of time to depart on schedule. With motors idling they wait on the starting line for the signal. And fully as promptly as a crack passenger train gets underway they start down the field, get into the air in a few seconds and head for their destinations like homing pigeons. Precisely at 11:30 the plane for Cleveland got under way and at noon, just as promptly, the Chicago plane was on its way. Aviation has certainly advanced since the days I first recall, and the Ford airport, under the direction of Major Schroeder, is making a dent in the old idea that any old time was all right for an airplane.

With the days of the old plane in mind I strolled through the shop where they are building the Stout all-metal airplane, on one edge of the field. The change from the days when bamboo spans and struts, occasionally tied together with wire, the pilot sitting out in the cold world, ahead of the wings, and other crude details, formed a background that made the Stout plane all the better, by contrast.

The wings are cantilevers built entirely of duralumin, internally braced so as to eliminate the use of guy wires and stays, and covered with duralumin instead of cloth. The fuselage is built in the same way and covered with the same material. The covering is corrugated, giving it the appearance of a huge washboard. And the way it stands up under the weather is both interesting and encouraging. A mail plane which had flown in for inspection was being washed like an automobile, and there was nothing to indicate that it was not a new machine just out of the shop. It had been in use considerably over a year, under all weather conditions.

Inside the shop the new planes were being built in a thoroughly modern fashion. Steel jigs and fixtures enable the spars and trusses to be built in duplicate with a minimum of labor. The spars then go into the wing fixtures and the trusses and frame work are riveted to them.

In the meantime the fuselage is being built in adjoining fixtures and, when both are ready, the huge wing goes into place and is fastened as though it grew there. If anyone doubts that duralumin has arrived, as a metal for airplanes at least, a visit to the Stout plant ought to help dispel his illusions.

There are, of course, thousands of rivets in one of these planes, and while each joint has been worked out so as to secure the maximum strength, the production has not reached the point of jig-drilling for every part. So, to avoid errors creeping in, a novel plan has been adopted to show exactly how each important joint should be riveted.

A large blueprint showing the construction is hung in a convenient place near the work. Pasted on the blueprint at a convenient point is a photograph of the completed joint. A line drawn from the joint on the blueprint to the photograph, makes it easy for anyone to see just what the finished job should look like and prevents errors. The idea can be adopted on other kinds of work as well.

Outside the shop a Fordson tractor was towing one of the Ford airplanes to the hangar. The two extremes of Ford transportation could hardly have been better illustrated.

British Car Manufacture

In an article published in a recent issue of the *Automobile Engineer* (England), details are given of various operations on the Austin car. The crankcase, for example, passes through 43 operations and is allotted a total machining time of 11 hr. 41 min. apart from the preliminary and final inspection. This time is what is allowed by the rate-fixing department, the actual machining time being considerably less. A number of special machines are employed, chiefly for the drilling and boring operations, but for the early operations, simple fixtures in conjunction with standard machines are utilized.

For the boring operation on the main bearing housing, a special machine is employed and it is used also for finish boring the generator and magneto holes and facing the inside of the big end bearing. A simple type of special machine is used in conjunction with a boring bar. This bar is built up of distance pieces threaded on a central mandrel slotted to receive the cutters. These are inserted in the position required, when a single nut serves to clamp all the cutters securely between the faces of the distance pieces. After boring, a hand reaming operation is carried out on the main bearings, after which the caps are removed and stamped so they can be identified when replacing.

For the production of crankshafts the machine tools are laid out according to the sequence of operations.

Production Equipment for Inspection

Speeding up inspection in the automobile industry — Inspecting chassis frames on a layout table— Checking up jigs and fixtures with the table

By W. E. Irish
Associate Editor, *American Machinist*

IN PRODUCTION work, and especially in the automobile industry, the inspection department is placed in the difficult position of setting the pace for the production department. No matter how rapidly the work is turned out it must first be inspected, and production will be held up until this can be accomplished.

The problems of the inspection department are very great at best and everything possible must be done to make its work as accurate and yet as rapid and simple as possible. The production department has its jigs and fixtures to make the job simple and speedy. Too often the inspection department has a few worn-out scales with which to check up the measurements of parts. The equipment furnished the inspection department should be no less adapted to "production" or rapid inspection than the specialized tools and equipment of the shop operator.

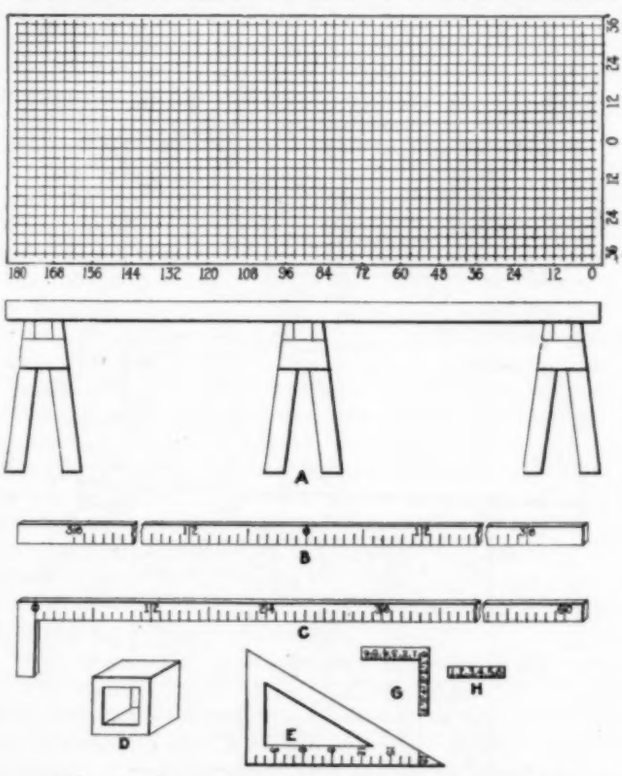


Fig. 1—Inspection table and its accessories

Realizing the importance of accuracy and rapidity, one chief inspector asked his men for suggestions in the line of equipment and methods of inspection. He felt that the men who were actually doing the work would have the best ideas as to how they could speed up their jobs. One suggestion appealed particularly to the chief inspector. The man who "checked up" for the floor inspectors, whose duty was mainly to detect parts that looked "off color," wanted a table and a few items to go with it such as were used in the layout department.

A plan and side elevation of the table are shown at *A* in Fig. 1, and the accessories also are illustrated. This table is made of cast iron sufficiently deep in section to maintain itself level when set on horses. The top and sides are surfaced and finished.

The outside dimensions of the table are 186 in. by 78 inches. From the longitudinal center line, parallel lines are cut in the surface 3 in. apart. In a similar manner, cross lines are laid out 3 in. apart with the zero line at one end. The steel scale, shown at *B*, and the square, shown at *C*, are made of ½x2-in. bar steel and marked in inches as shown.

The cast-iron blocks, with all surfaces finished, shown at *D*, measure 6x6x3 inches. The steel triangles at *E*, made in several sizes out of 14-gage steel, are marked in inches and fractions, as are the small steel squares, at *G* in the illustration. The 6-in. scale and a standard 18-in. combination square were purchased.

Floor Inspection Difficult

Pressed-steel work, especially in the automobile industry, is extremely irregular in design and presents many checking difficulties unless suitable facilities are provided. Out on the floor it is necessary to use long tapes and often measurements have to be taken on automobile frames and parts from imaginary center lines. Since all this inspection must be done without in any way slowing up production, reference to Figs. 2, 3 and 4 will make evident the advantages of the inspection table.

In most cases, the locations of all parts are made longitudinally in relation to the front hangers of the chassis frame, or the method of dimensioning is such that any measurement can be dated from this point. Cross dimensions are usually taken from an imaginary center line, which explains the method of marking the table from the longitudinal center and from one end.

The chassis frame is set up on the blocks *D*, which are placed in such locations as will make the frame level. Two of the long scales *B* are then laid across the frame in line with two of the cross members, one near the front, and one at the rear. They are placed so that the same figure reads in line with the outer edge on each side.

Two of the triangles are set on the center line of the table, and the frame then moved until the zero on the scales (in the center) coincides with the center line on the table, thus establishing the frame on the long center.

Next the frame is moved lengthwise until the left front hanger registers over the zero line at the end of the table. It is then ready to check, which can be done in less time than it takes to tell.

The table proved a splendid time saver. The principal object in checking the assembled frame is to establish the correctness of the assembly-jig setting and it was assumed that if the jig was right, the results from it would meet with the customer's approval.

On account of the rough usage to which this jig was necessarily subjected by the riveters, it was found advisable to give it a complete check at least once each working day. It can be seen that without such help as the table afforded the checking would be impossible in a

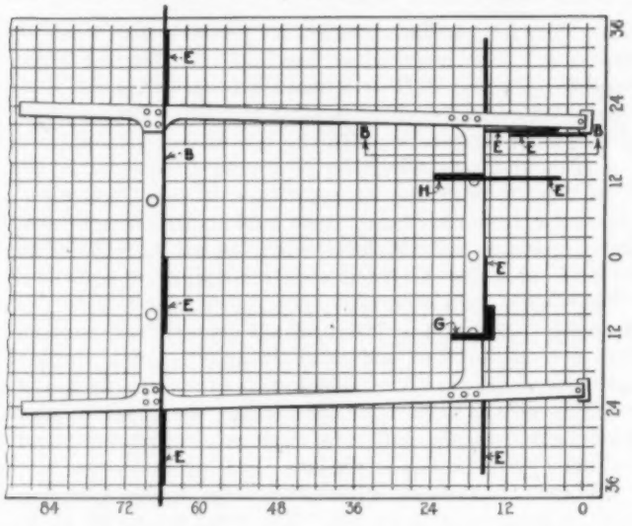


Fig. 2—Top view of a chassis on the inspection table

time short enough to meet production requirements. With the table, however, the checking was a comparatively simple matter, and the results could be given the assembly-floor inspector in a few minutes.

Reference to Fig. 5 will show how the checking is now being done. The view marked "as specified" represents any frame. The dimensions for widths over all from the center line, and all those from the front to each cross member, are inserted in one of the blank forms. In case the form shows more cross members than are actually in the frame, an "X" is placed on those to be omitted.

With this part of the form previously made out, the table inspector, as he has come to be known, starts on whichever side of the frame is set in position and sets down in the diagram marked "as found," the amounts

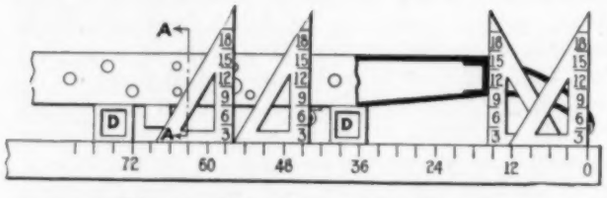


Fig. 3—Side view of the chassis

plus or minus where each actual dimension fails to meet with the one required. He marks the dimensions plus if it is too far to the rear or to the side, and minus if it lacks any of the distance called for. The application of the triangles and scales is shown in Fig. 2, in the plan and section.

It can be seen that the greatest actual distance he has to measure with a scale is something less than three inches, the distance between any two of the table lines. Vertical dimensions can be taken from the triangle direct.

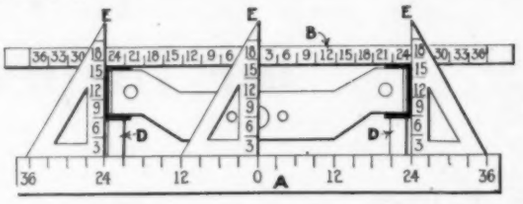
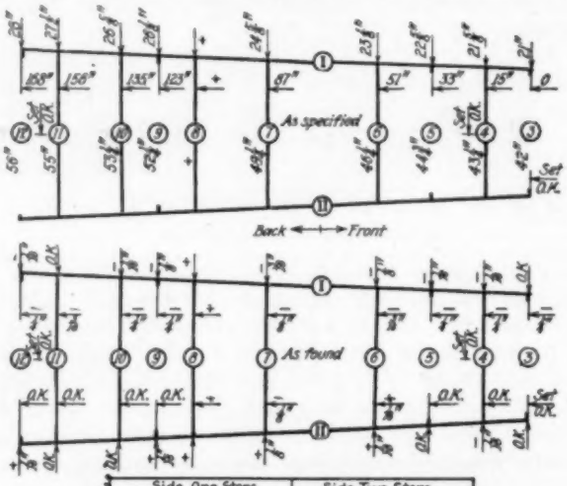


Fig. 4—End view of the chassis

When he fills all dimensions in the "as found" diagram he proceeds to fill in the table just below, thus showing what should be done to the stops on the jig. As soon as this is complete he delivers the form to the assembly inspector so that he may immediately correct the jig.

A little study of the particular case shown on the form reveals that the stops for the entire side of the frame at I are about a quarter of an inch too far toward the front and that the frame has a bend toward the side II of about three-sixteenths of an inch. Correction of these two points would at once make the jig produce good work.

It can be seen that it would be too late in the process of production to check perforations or forming of any of the parts after assembly has been completed, so no



Side One Stops					Side Two Stops				
Set	Front	Back	In	Out	Set	Front	Back	In	Out
1		1/8"			2	O.K.			
3		1/8"	O.K.		3	O.K.		O.K.	
4		1/8"		1/16"	4	O.K.			1/16"
5		1/8"		1/16"	5	O.K.		O.K.	
6		3/16"		1/8"	6	1/16"		1/16"	
7		1/8"		3/16"	7		1/8"	1/8"	
8	+	+	+	+	8	+	+	+	+
9		1/4"		1/16"	9	O.K.		1/16"	
10		1/4"		1/16"	10	O.K.		O.K.	
11		3/16"	O.K.		11	O.K.		O.K.	
12		1/4"		1/16"	12	O.K.		1/16"	

Fig. 5—Frame assembly checking diagrams

attempt is made in this direction. As each part is started in the shop, however, the first one from each machine is brought to the table inspector, who would set it up and check all points relating to the particular operation.

When checking these parts it is not necessary to set up to the zero and center lines on the table, since with the help of the scale *B* and the square *C* laid properly,

any convenient lines can be taken for reference. In fact it is not out of the ordinary to have several pieces set up at the same time.

It would be impossible, without seeing this table in actual service, to appreciate the saving of time that resulted, therefore this feature will not be given consideration further than to say that the saving has been much greater even than that hoped for by the department which developed the method.

The description itself serves to illustrate the use of one standard piece of production equipment with reference to the inspection department and to indicate what can be done by employing similar methods in most any company. There are many tools used by the production man that can be turned to the inspector's advantage to help him in his part of the work of getting production.

Uniform Invoices

BY E. J. KULAS
President, the Otis Steel Co.

The present practice of organizations that are called upon to prepare invoices is to use a separate invoice for each order. The information contained upon these forms, with the exception of the order numbers and such data, is the same in each case. If there are six orders there will be six invoices with the same duplication of information and consequent waste. The purchaser will receive them all and will probably place a large rubber stamp on each, half obliterating most of the material on the invoice.

These six semi-mutilated bills then start traveling through the plant in conjunction with a large number of other invoices of varied size with the date, order number and other material spattered over each in a different place until checking the invoice becomes a job for a "blind reader" at the dead letter office.

In the production of these six invoices, at least 30 per cent of the work is duplicated and hence wasted. In the receipt and approval, the confusion in size, form, terminology and typographical appearance adds a needless labor charge of at least another 25 per cent.

F. H. Diehl, purchasing agent of the Ford Motor Co., has devised a uniform invoice that means a substantial saving. Instead of addressing the customer six times for his six purchases and introducing the form each time into the billing machine, this form reduces it to one operation and permits the listing of all items purchased in a given day with the customer's order number and without duplication of such items as the name, shipping directions and terms.

This invoice makes unnecessary the use of the customer's stamp which will be likely to deface important data, because it reserves a space on the bill-head for the customer's use in checking. This definite space centralizes all information in a particular place where it may be looked for without delay. The uniform invoice gives a continuous writing space with natural carriage shifts for the typist, permitting maximum speed and accuracy.

Mr. Diehl contributes the plan, with no idea of royalty, to the manufacturing public and any expressions of opinion may be given to E. J. Kulas, president, the Otis Steel Co., Cleveland, Ohio, who is endeavoring to encourage a widespread adoption of this improved uniform invoice.

Recommended Practice for the Inspection of Disk Gear Cutters

The following report made by the Inspection Committee of the American Gear Manufacturers' Association was adopted as Recommended Practice at the fall meeting held at West Baden, Indiana:

1. HARDNESS: This may be tested by any of the standard hardness testing instruments and by file.

2. BORE: Check diameter and roundness by use of plug (Fig. 1, A. G. M. A. Recommended Practice, revised April 20, 1922), or micrometer gages. Check keyway size and alignment by use of plug (Fig. 5, A. G. M. A., Recommended Practice, revised April 20, 1922).

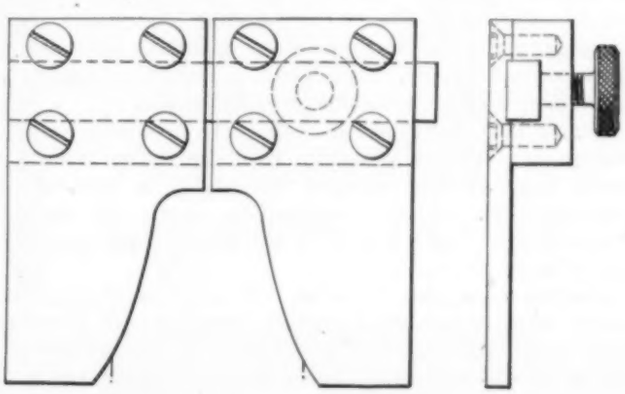
3. WOBBLE: Check sides for running true, also form of cutter for wobble.

Use standard centers with indicator attached, having cutter mounted on suitable shoulder arbor.

4. CONCENTRICITY AND RADIAL SHARPENING: This may be done on standard testing fixtures especially built for this purpose. Cutter to be rotated against indicator for concentricity and the radial accuracy tested by using finger on the fixture provided for this purpose.

5. FORM CENTRAL: Single Finishing Cutters. This may be checked on standard centers with indicator. Cutter is mounted on shoulder arbor and indicator reading taken. Cutter is then reversed on arbor and should show same indicator reading.

6. TOOTH FORM THICKNESS: This may be done with standard tooth calipers. Care should be taken to make the necessary chordal and perpendicular allowances in making this check. See any standard table on gears or gear cutters. If cutters have hooked teeth or are made with side clearance on form, special allowance (which will be furnished by cutter manufacturer) must be made when using tooth calipers.



Adjustable tooth form template

7. TOOTH FORM, LANTERN METHOD: By use of a projecting lantern compare the tooth form with a predetermined form constructed from a proven satisfactory cutter. Select a magnification sufficient to insure the desired accuracy and keep the form being tested near center of lens.

8. TOOTH FORM, GAGE METHOD: By the use of adjustable templates from No. 1 to No. 8, having the correct form for each range of teeth, as in the illustration. Templates to be adjustable in parallel plane to take care of variations in width of form.

Unethical Use of Manufacturers' Drawings—Discussion

By A. D. Evans

IN AN editorial on page 488, Vol. 63 of the *American Machinist* there was raised the question of the unethical use of manufacturers' drawings. In requesting certain detailed drawings of a machine tool being purchased, a purchasing agent or engineer, in my opinion, is within his rights and the manufacturer withholding the prints of small moving parts is imposing an unnecessary hardship upon the ones responsible for the maintenance of the tool.

A pertinent example of the advantages, to the user, in the possession of tool details is found in a recent experience of ours. The speed-change gears of a modern 48-in. motor-driven engine lathe were worn so that replacing was advisable. Since no drawing or part list had been furnished with the lathe, the maker was asked to supply data from which the parts could be ordered. Our request was not granted, but instead, the manufacturer sent a service engineer to our plant to examine the lathe.

The service engineer gave the machine a perfunctory inspection and pronounced it obsolete. Notwithstanding our repeated assurance that we were entirely satisfied with its producing capacity, this high-power salesman insisted that we buy a new lathe and offered nothing further.

From this visit we learned nothing, acquired nothing that would enable us to order the parts, and we had no alternative save to repair the machine ourselves, which necessitated dismantling, making sketches, reassembling, using the worn parts and operating until new parts could be made, after which a second rebuilding would be necessary, involving production loss.

It may be pointed out that the case is unusual and that parts lists are generally furnished. This fact I admit, but add that ordering from stock is often undesirable since the time required to replace the parts is frequently from a month to six weeks, again resulting in costly delay.

Quoting from the editorial, "If a just and proper charge were made, based on the cost of the drawings, their acquisition would not seem so desirable to the purchaser." I cannot see why the purchaser should be charged directly for the drawings when the cost of preparing them is included in the sale price of the tool, particularly, when the drawings are made primarily for the manufacturer's own use, and would be necessary for his own operation even if the prints were never furnished to the user. It would seem that the actual cost of supplying detailed prints should amount to the cost of the paper plus the time required.

Again quoting from the editorial, "The principal danger occurs when the drawings come into the possession of foundries and machine shops inexperienced in the work and unacquainted with such special requirements as the iron mixtures used, the peculiar character of the workmanship, and so on." Does it constitute a greater hazard for the user to replace a part that has failed, from the drawing than from the failing piece or part itself? And could not a competitor copy some particular design as readily from the machine itself as from the drawing from which the machine was built? I can see no advantage to the operator in possessing complete details of a machine, such as the base and bed castings, since these parts could not be economically produced because of the patterns that are necessary to them, but detailed prints of small moving parts are obviously valuable.

The questions here raised are the opinions of a user of machine tools who believes the question of furnishing certain detailed drawings of mechanisms to be worthy of further thought and discussion on the part of the trade generally, and who is interested in the opinions of others on the subject.

Welding Boilers

By S. W. Miller
Past President, American Welding Society

In view of the ever-widening applications of fusion welding throughout industry, and the probability that repairs to boilers made in this way will be proposed from time to time, it is well that those responsible for the results should bear several points in mind. For simplicity, these are listed briefly below:

(1) Most boilers are insured.

(2) Many boiler insurance policies are so worded that if repairs are made without the authority of the company carrying the insurance, the policy becomes void.

(3) There are Federal, State and Municipal regulations governing this work, as well as those issued by the insurance companies.

(4) Only competent welders, accustomed to boiler work, should be allowed to do the welding.

Therefore, the following precautions should be observed by the owner or his representative:

(1) Examine the part of the boiler to be welded in company with the insurance company inspector, and get his approval before doing any welding.

(2) Be present at the test, after welding, with the inspector.

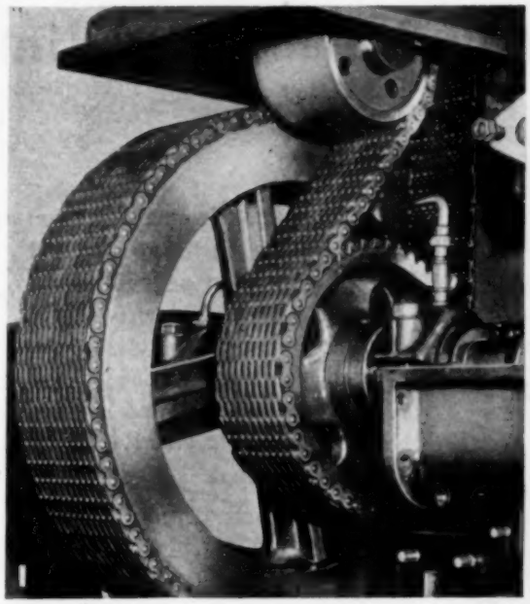
(3) If possible, get the inspector to sign a statement that the work has been properly done and that it has passed the test successfully.

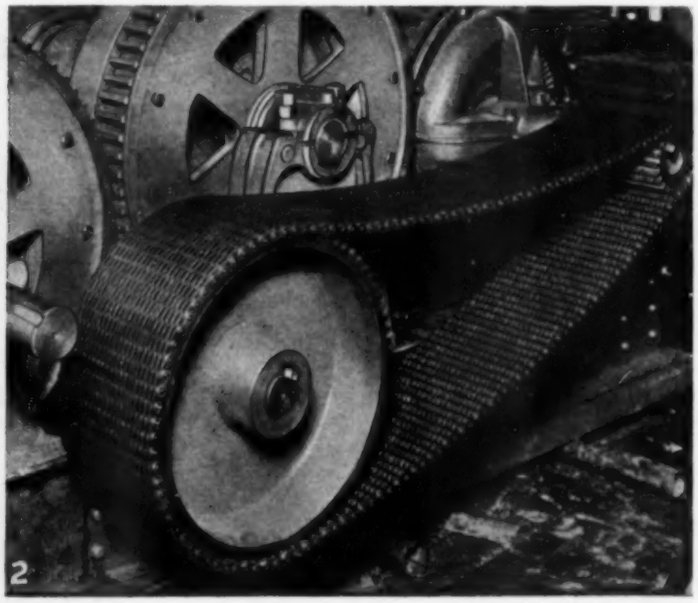
(4) If the boiler is not insured, and comes under Federal, State or Municipal supervision, carry out the above program in company with the proper authority.

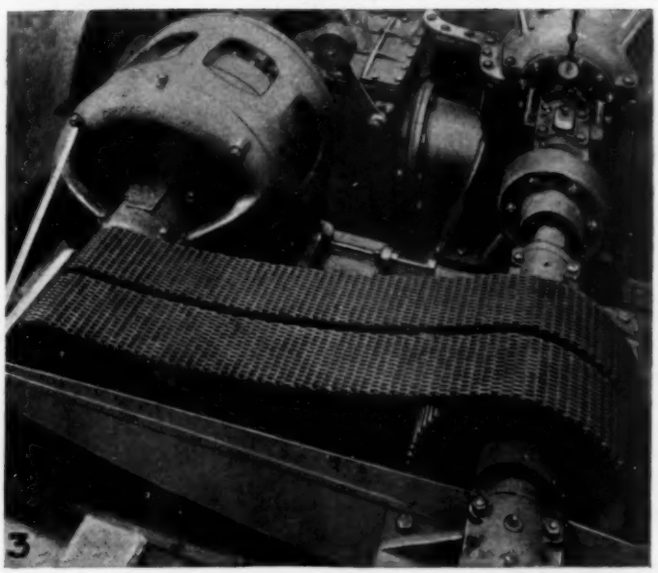
If the boiler is neither insured nor under supervision of some constituted authority, ample precautions should be taken by the welder and the owner to protect themselves against possible future trouble. They should make a sketch of the location and size of the repair, with a clear statement of what was found wrong and how the repair was made. They should always make a hydrostatic hammer test of the finished job, using a pressure of one and one-half times the working boiler pressure, in the presence of witnesses, and get their signature to a statement of the facts. These papers should be carefully filed away. No welding should be done which is not permitted by law or by good practice.

In case of marine work, the welder should pass the regular examination of the Federal Steamboat Inspection Service.

In all cases, the welder should make friends of the insurance and other inspectors by refusing to do work unless authorized by them, by being conservative in what work he recommends, and by doing nothing except a first-class job.







Chain Drives for Power Transmission

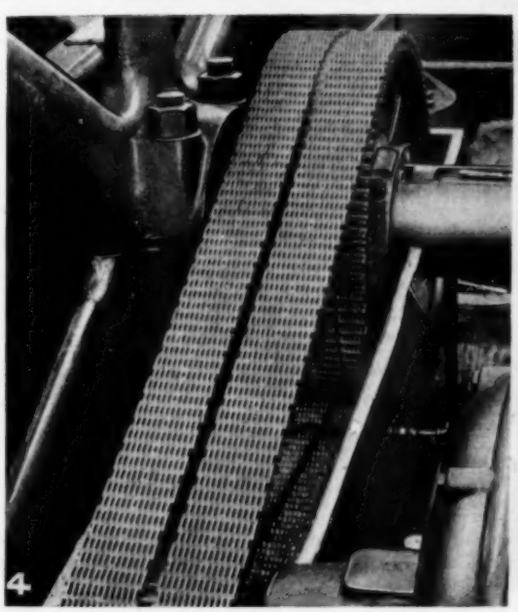
1—Whitney chain on De La Vergne engine

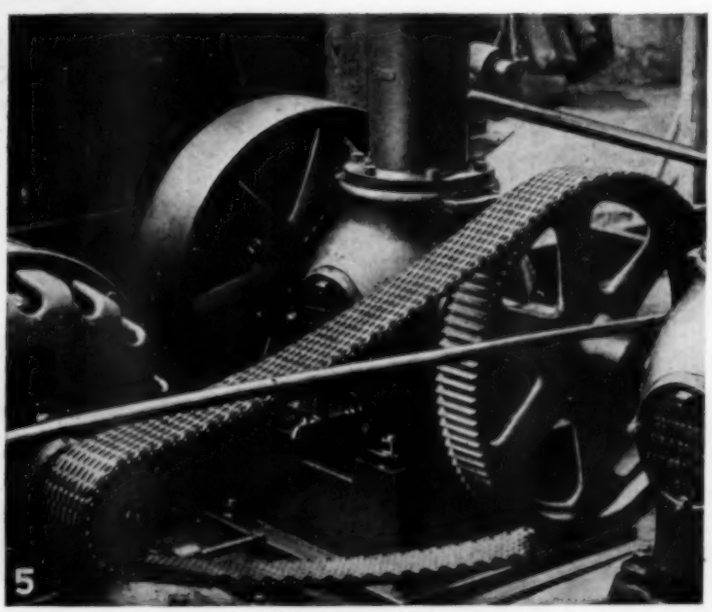
2—Hoisting unit driven by Whitney chain

3—Whitney chain on centrifugal pump

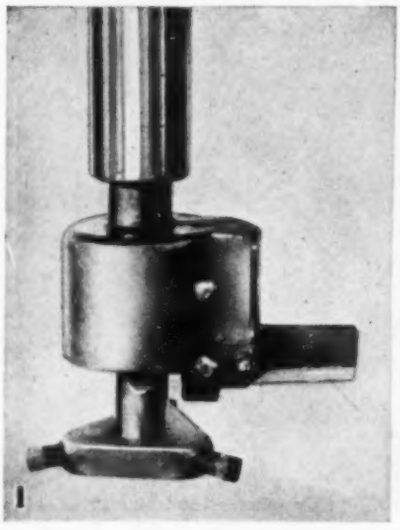
4—Renold-Boston chain on oil engine

5—Air compressor with Whitney chain



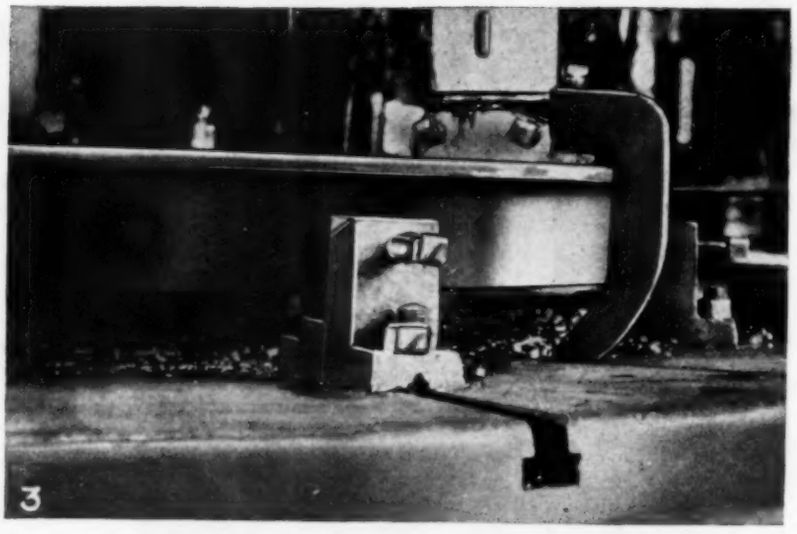


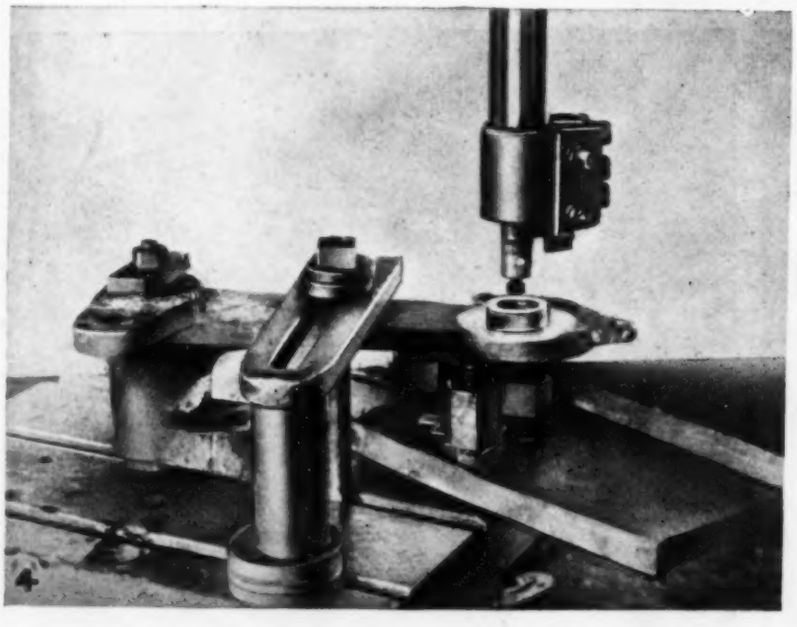
Handy Devices Used in the S



1 and 2—Tools for cutting steam pipe joints, both flat face and ball joints, on a radial drill press. The spider or pilot block is adjusted to any desired position by use of the setscrews shown and guides the tool while steadying the work.

3—Clamp for holding tires on boring mill. The foot of the clamp slides in the slot of the boring-mill table, the upper part of clamp reaching around over tire. This device eliminates all bolts, blocks and clamps so that all the pressure comes on the tire.

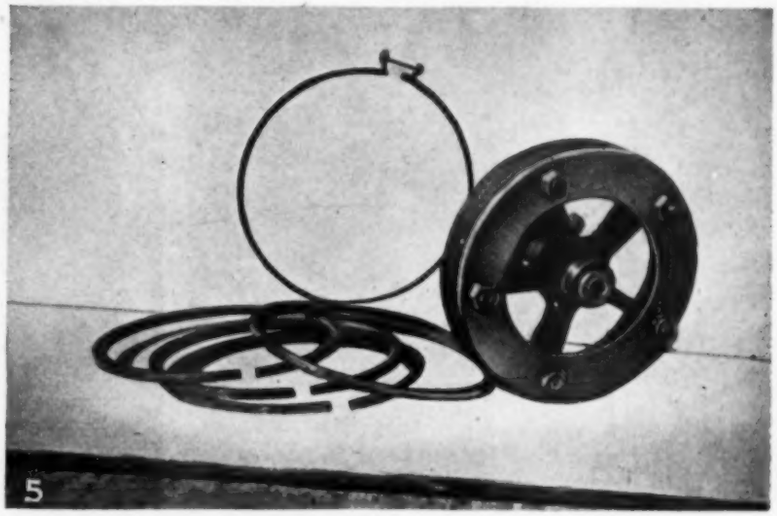


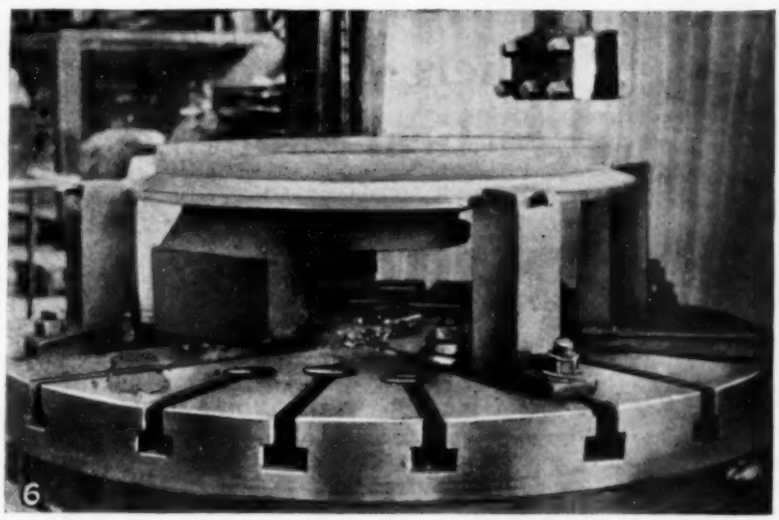


4—Jig for holding, and a tool for machining, brake hanger bosses of all classes of engines on a radial drill press. It releases the boring machine, on which the work was formerly done, for other work.

Santa Fe Railroad Shops

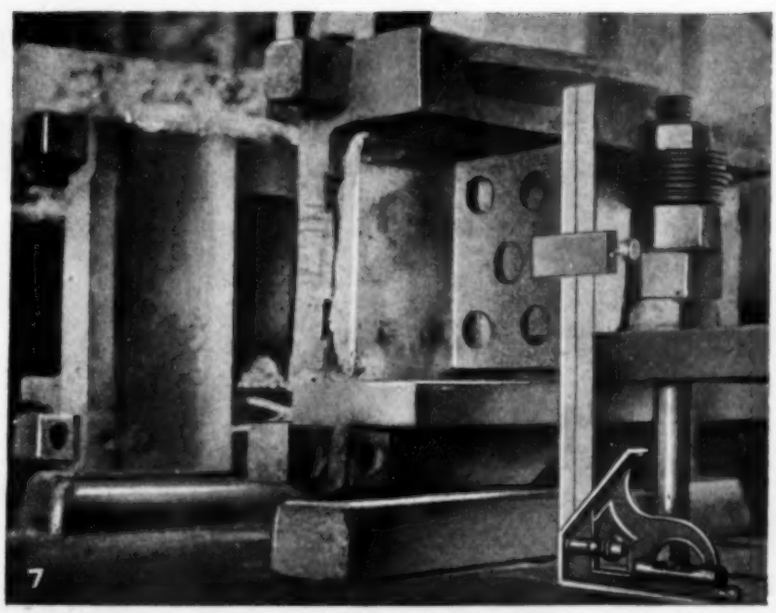
5—A device for turning valve rings to fit bored valve chambers. The outside diameter of the ring is 15 7/16 in. and the valve chambers are only 15 5/64 in. The rings have 5/8 in. cut out and are recessed for dowels. They are then sprung together and placed on the jig, to be turned to exact valve chamber size.





6—Back cylinder head on special jaws on boring machine. Guide blocks cast on back heads require an extra high chuck jaw to hold them. Jaws were made in the local blacksmith shop.

7—This device reaches over the driving box flanges and can be moved up and down on the scale to suit driving boxes of different sizes. Saves calipering from scale to the box, and shows at a glance whether the box is set up so that bore will be square with the shoe and wedge faces.



Where Boys Learn Practical Shop Work

1—Lathes and a gear hobber

2—Toolcrib in the machine shop

3—Part of the wood working shop

4—General view of machine shop

Photographs by courtesy of the College of Engineering, Cornell University

Permanent-Mold Aluminum Castings and Their Field of Usefulness

By J. B. Chaffe, Jr.
The Permold Co.

Overcoming shrinkage problems—Venting in permanent-mold castings—Advantages of the permanent-mold process—Applications of three types of aluminum-alloy castings

PERMANENT-MOLD aluminum castings are made by pouring molten aluminum alloys into warm metal molds with an external pressure applied to the metal. The idea of permanent-mold castings appears to be simple, but however simple it seems, and however successful have been the experiments with other white-metal alloys, there is a "nigger in the woodpile" in the case of aluminum alloys and that "nigger" is crystallization shrinkage.

The shrinkage in volume on freezing in the most commonly used aluminum alloys amounts to nearly 7 per cent and even in the newer low-shrinkage alloys it amounts to about 5 per cent.

The molds, therefore, are designed so that there is a progressive freezing from the furthest points of the casting to the gates, and the gates and sprues are the last parts to solidify. If this requirement is not met, there are sinks on the surfaces which are the last to set when the mold is hot or there is porosity if the mold is somewhat cold. The faults nearly always appear on the surface and are so evident that even a casual inspection will reject the casting.

Aluminum alloys have a high coefficient of thermal expansion and a marked weakness at very high temperatures, requiring the ejection of the casting from the mold at the right time which only experience can determine. The failure to eject the casting properly or at the proper time shows itself on the surface in the form of cracks.

If the mold is not properly vented, sections will not fill. Since the molds are usually hand-poured and since there is no external pressure on the metal, the flow of the molten metal is smooth and there is little likelihood of entrapping air in the metal.

All of these factors must be cared for in the design of the molds, giving the designer thermal and metallurgical as well as mechanical problems to solve. The making of good permanent-mold castings is a snare and a delusion to those who do not fully comprehend the fundamental principles.

To take care of crystallization, the sand founder can often gate the castings where he desires, but in permanent molding the gate must be on the parting line. In sand, risers can usually be placed where needed but the permanent mold often will not permit them. A chill is a God-send to the sand founder—it often solves the difficult casting problem, but to what can the permanent-mold user look for the same help? He can and often does vary the thickness of his mold, but a thin mold, without special precautions, will warp, and one of varying sections warps badly. Some manufacturers have resorted to inserts of a metal with a higher heat conductivity than iron to act as a chill does in sand, but this expedient is none too satisfactory. The insert erodes, works loose or shows a bad mark on the casting and often it does not solve the problem.

The coefficient of thermal expansion of aluminum alloys is about twice that of cast iron. Sand foundrymen complain about castings cracking when the sand cores are a little hard but imagine the problems in using solid-metal cores. These metal cores must be pulled at the right time, not too soon or the metal will run, and not too late or the casting will be cracked.

In addition to this trouble there is the frequent need of making the cores in parts so that they can be pulled. A casting with a flange extending inward requires the use of five-part cores and more complicated shapes require cores in seven parts or more. These cores must be kept in good condition to avoid fins and flash where they fit one another.

Venting is another consideration for the metal molder. In sand practice the use of an open sand or the use of a vent wire to open up the sand often relieves any anxiety on this score, while in permanent molding special arrangements must be made to get rid of the air in the mold cavity. Special venting is easy on the parting faces of the mold but it is surprising how difficult it is in a somewhat complicated part.

A permanent-mold founder once tried to make a flat plate seven inches in diameter. He cast this just as a sand founder would cast it, laying it down flat. Before he got a good casting, he had to put in twenty-four vent pins over the face of the casting and the mold looked like a porcupine. This manufacturer should have entirely forgotten any sand-casting practice and should have made this plate vertically, but that did not occur to him until the experimental work with the mold had cost him several hundred dollars.

In sand-casting practice, a molder will make up a number of molds and then pour off the lot of them at one time, the melter has to bring his metal up to temperature and pour off rapidly. In permanent-mold work, however, the metal must be brought up to temperature and kept at temperature for a period of one to nine hours and it is believed that the possible range of temperature of the metal is much less in permanent-mold work than in sand-casting practice. Closer supervision and greater expense necessarily follow.

Abstract of a paper presented at the meeting of the American Foundrymen's Association, held at Syracuse, N. Y., Oct. 5-9, 1925.

The usual practice in permanent-mold work is for the foundry to pay for the repair and renewal of the mold equipment, while in sand-casting practice the customer is supposed to furnish suitable pattern equipment and the customer pays for the maintenance of the equipment. When a permanent mold fails to produce castings in accordance with the customer's prints it is up to the foundry. Another comparison that should be seriously considered is the working conditions in the foundry. It is true that a sand foundry often is dirty and the presence of the sand seems to have an effect on the management to cause them to permit even the windows to remain dirty, but there is no excuse for a permanent-mold shop to be dirty.

However, this advantage of adequate light and cleanliness is largely overcome by the fact that the permanent-mold operator is subjected to much greater heat. All day long he works over a hot mold. He has a holding furnace at his back and the hot castings on one side. They give off so much heat that artificial ventilation is practically a necessity, particularly in warmer weather. It is questioned if the purchaser of castings expects as perfect a product in sand castings as he does in permanent-mold work and therefore the inspection of the permanent-mold castings must be closer.

Fortunately for the user, however, the faults in permanent-mold castings are easily detected; these faults are almost invariably evident on the surface of the casting, so the user can depend upon a solid section if the surface is good. With permanent-mold castings there is no need of the precaution to "Save the surface and you save all," since they are solid all the way through. There is not a great deal of difference in the appearance or strength of the metal at the surface and in the center of the casting.

The molds are kept relatively hot while in operation but considerably below the melting point of aluminum alloys so that the moderate chilling of the permanent mold bestows on the casting a dense fine grain, causing an increase in tensile strength, elongation and hardness. The fine grain also improves the polishing qualities of the casting.

Some of the advantages of the permanent-mold casting can be listed as:

1. Freedom from blow holes and porosity.
2. Dense, homogeneous and fine grain.
3. Freedom from black spots, pin holes and "carbon tails," when polished.
4. Greater strength, greater elongation and greater resistance to impact.
5. Relative accuracy in dimensions.
6. Smooth bright surfaces.

Coarseness of grain and pin-holing are accentuated in sand castings by high pouring temperatures. If melting and pouring temperatures are kept low, considerable improvement can be effected in respect to these defects. Under the most carefully controlled conditions, however, employing normal foundry practice and treatment of melts, it has not been found possible at the laboratory to effect more than a certain degree of improvement in unsoundness.

In the pressure die-casting process, a cavity in a metal mold is filled with molten metal under pressure through a thin gate. The gate is thin so as to reduce the turbulence of the molten metal in entering the cavity and to allow a time interval during which the air in the cavity can be forced out through the vents. After the cavity is filled with molten metal, the small gate freezes and cuts off the source of hot metal. The skin of the casting next to the cold mold freezes and the solidification shrinkage of about 7 per cent is fed from the center of the casting or from heavier sections which are still molten.

The former chief engineer of a prominent pressure die-casting manufacturer explained this condition in an address before the Detroit branch of the Society of Automotive Engineers in March, 1925, as follows: "Porosity is an inherent feature of commercial high-pressure die castings. At first it was believed that this was due to the presence of air. The vacuum process was introduced so that the air was drawn out of the die cavity before the metal entered. Even if it were possible to maintain a vacuum under practical working conditions, this method does not offer the complete remedy. Practically the same results may be obtained without a vacuum if the proper size and location of the gate and vent grooves are carefully considered.

"There are two other causes for porosity; namely, uneven chilling of the metal and drossy, sluggish metal. To illustrate the first cause, consider a die casting gated so that the metal must travel through a thin section to reach a heavy boss. Normally the boss will solidify last, but since the thin section between it and the gate is already frozen, it has nothing to draw from to satisfy its natural shrinkage and the difference is made up by a void or hole in the center. This fact emphasizes the importance of proper distribution of water channels in the die.

"The second cause is self-evident, for a die casting cannot have a cleaner surface than the original alloy. If too many impurities are in the alloy, its flow becomes sluggish and it chills before the shrinkage is satisfied even in uniform walls. However, the outer crust is so much greater in density and strength that it more than compensates for the porous structure in the center of the wall."

The skin of the pressure die casting is of a dense grain structure and therefore if this skin is not taken off in machining or in polishing, the presence of the voids in the center of the casting does not affect the utility of the part when the part is not subjected to strains. But this porosity must weaken the section materially and, therefore, it is felt that continued work will be applied to the pressure die-casting process to eliminate this porosity or parts subject to severe strains should be made in permanent mold.

A sand casting is used in parts having difficult coring, such as automobile intake manifolds, cylinder blocks, vacuum-cleaner fan cases and nozzles. Likewise, a sand casting is used in parts of large dimensions such as automobile crankcases and oil pans, though foreign manufacturers are now making some of the smaller crankcases in permanent molds. A sand casting is often more economical when the quantity required is small, because pattern equipment cost is less.

It should be remembered that the sand-casting process is well known and that until about 1912 all aluminum-casting production in this country was done in this process. The other methods, using metal molds, have taken business away from the sand foundries since then. There are yet a great many parts made as sand castings that might be made better and more economically by the other processes and it is to be expected that this diversion of business will continue as the other methods become better known.

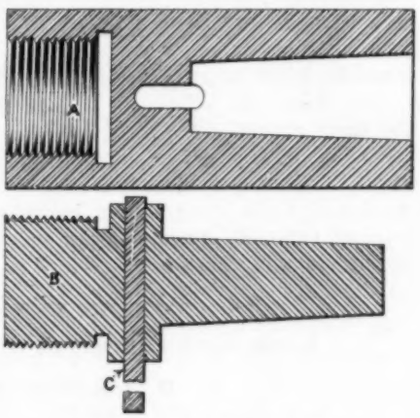
Ideas from Practical Men

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from five dollars upward, according to their merit

A Drill Holder for the Lathe

BY CHARLES KUGLER

The sketch shows a holder for large taper-shank drills, when the latter are to be used in a lathe, that can be depended upon to drive the drill without slipping and cannot cause injury to the taper hole of the spindle. It consists of two parts, one to be used in the live spindle and both when the drill is to be used in the tail spindle.



Drill holder for a lathe

The manner of using the tool is obvious from the sketch. Part *A* is made to screw on the spindle nose and has a taper hole to take the drill shank, including a drift hole and a slot to accommodate the tang. I have never seen any other device that will drive a drill positively in a lathe spindle.

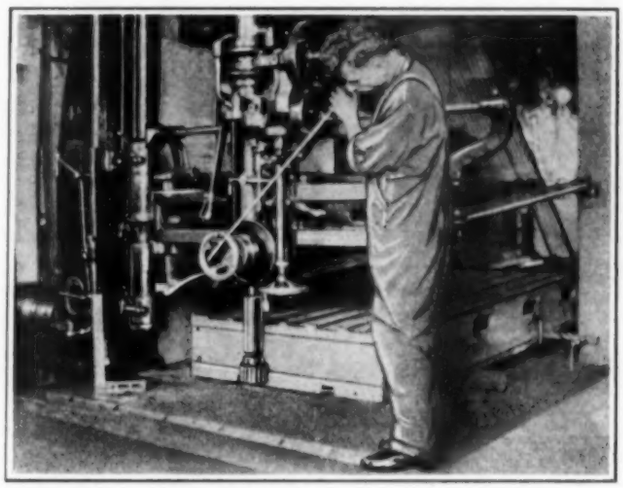
The shank of part *B* is fitted to the taper hole of the tail spindle and the opposite end is shouldered and threaded to correspond to the other piece. When placed in the spindle the cross-arm *C* should rest upon the wing of the carriage.

Milling on a Radial Drill

BY R. S. BRESKA

Recently, we were faced by the problem of milling the ends of two heavy castings. We had no facilities for either milling or planing such large work, and were quite "put to it" until it occurred to us that the radial drill might be used as a vertical milling machine.

The illustration shows how the work was done. The arm of the drilling machine was attached to a near-by post, by means of a heavy bar of flat steel, this holding the arm rigidly. The casting had to be moved into position for the cut and aligned with the arm of the machine by hand. The up-and-down feed of the cutter was taken care of by the regular vertical feed of the machine, while traverse feeding was done by the mechanism for moving the head along the arm, using a lever on the handwheel.



How the work was done

The cutter was a heavy one with inserted teeth, and did the work in a satisfactory manner. Since each of the castings weighed two tons, it will be seen that the cost of having the work done in an outside shop would have been expensive.

Tools for Making Cork Washers

BY DAVE MINTZ

Recently it was necessary to make several hundred washers of composite cork. The washers were $\frac{13}{16}$ in. in diameter, $\frac{1}{8}$ in. thick, each having a $\frac{1}{4}$-in. hole in the center.

Since it was almost impossible to stamp out the washers without leaving burred edges, I decided to try cutting them out on a drill press, for which I made the tools shown in the illustrations.

For cutting the center holes I made a tool from a piece of $\frac{1}{4}$-in. seamless-steel tubing, 0.035 in. thick, as shown in Fig. 1, beveling the edges on the inside

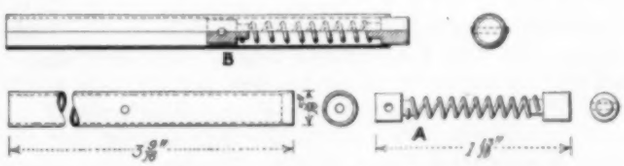


Fig. 1—Tool for cutting holes in cork washers

at one end. To keep the small cores from clogging the tool, the plunger and spring at *A* were applied, the completed tool being shown at *B*. When in position,

IDEAS FROM PRACTICAL MEN

the plunger projected ¼ in. from the end of the tool. In operation, the plunger was forced inward while the cork was being cut, and when the tool was raised, the pressure of the spring on the plunger ejected the small piece cut out.

A similar tool, shown in Fig. 2, was made to cut out the washers. In this case, however, the cutting edge

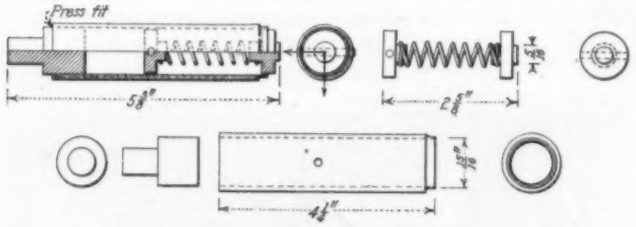


Fig. 2—Tool for cutting out cork washers

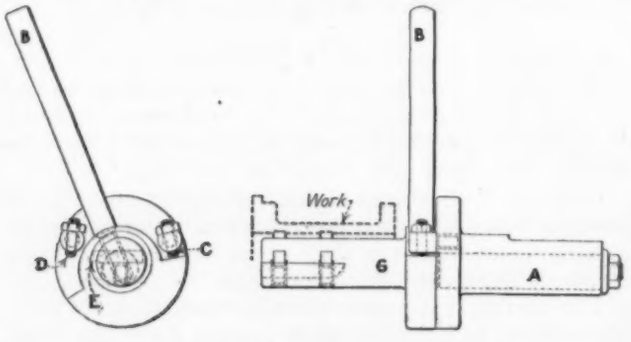
was made by reducing the outside of the tube as shown. The plunger had a small pilot on the end to enter the hole cut by the first tool.

By the use of these tools, the cutting could be done as fast as they could be manipulated and the stock fed under them.

Tool for Grooving Bearings

BY WILLIAM VAN ASSEN

The illustration shows a simple tool for cutting two grooves at one time in a cam shaft bearing. The shank *A* is made to fit the turret of a screw machine. The operator pushes the handle *B* away from him to bring the tools into action, the depth of the cut being limited by the stop *C*. Stop *D* limits the movement of the handle in the opposite direction. The cutting tools *E*, are standard toolbits set to cut upside down, so that the



Grooving tool for screw-machine use

chips will drop to the bottom of the hole in the work, giving the tools free cutting action. The body *A* has an eccentric hole in which the tool carrier *G* is a slip fit. The latter has a corresponding eccentric shank.

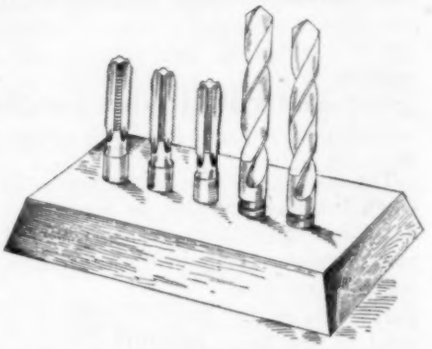
It will be noted that the handle *B* is screwed into the tool carrier, and has a 45-deg. chamfer at the upper part of the thread. The handle proper is countersunk well into the tool carrier. This construction renders the handle less liable to be broken off.

This tool may be designed to produce any number of grooves at any required spacing.

A Time-Saving Tapping Set

BY H. L. WHEELER

On many tapping jobs a lot of time can be saved by the use of the simple tapping set here illustrated. It consists of a wooden block provided with suitable holes to retain three taps, a body drill and a tap drill. This combination enables the tool-crib man to check out five tools on one check and also saves the machinist's time on the job. When the set is complete it is an easy matter to keep track of the five tools it contains.



Block for holding tools used in tapping

The holes in the block should be drilled at least 1/32 in. larger than the shanks of the tools. A series of blocks can be made for the various sizes, and hard wood should be preferably used. The sizes of the taps contained can be stamped or painted on the sides of the blocks.

Lineshaft Placed at an Angle

BY MILTON WRIGHT

A novel method of putting up counter and lineshaft for a group of automatics that at first glance gives the observer the impression that something is out of plumb, but which upon maturer consideration has much to recommend it, may be seen in the accompanying illustration.

The machines are set in groups of six, three on each side of the central aisle, at the usual angle to allow the bar stock in the carrier of one machine to pass behind the machine adjacent to it; but instead of run-

Group drive for automatics

IDEAS FROM PRACTICAL MEN

ning one long lineshaft down the center of the room to serve a whole department and providing each counter with the usual semi-universal joint to compensate for the angle at which the counters must stand in relation to the lineshaft, the latter is divided into sections just long enough to cover three machines, and is placed at the same angle at which the machines are set.

This method allows a single-piece countershaft to be used instead of a jointed one, since all the shafts are parallel. It makes a long and a short belt at one end of the line and the same conditions, reversed in relation, at the other end, but it does not require any more belting in the aggregate. The driving motor is, of course, set at an angle to correspond to that of the shaft.

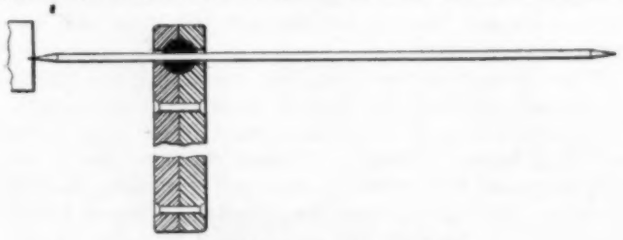
This experiment was put into practice in the shops of the Fellows Gear Shaper Co., where it was found that the driving motor, which previously would show signs of distress under certain conditions of load, now possessed ample power to drive under all conditions.

An Inexpensive and Reliable Wiggler—Discussion

BY J. T. TOWLSON
London, England

In an article under the title given above, on page 935, Vol. 62 of the *American Machinist*, S. B. Richey's account of his "wiggler" is a most interesting description of a useful machine-shop device that, as most readers will agree, occupies by no means so prominent a place in the toolmaker's kit as it once did. With far more accurate means for laying off work, including buttons, slip-gages, sine-bars, etc., at his disposal, the modern workman all but bars even fine lines, to say nothing of center-punch marks.

Agreeing, however, with Mr. Richey that the wiggler is still a useful device, I am submitting a sketch of the kind I favor. It comprises nothing more than a holder, made in two parts and joined together as shown; a ball with a hole drilled through the center; and a pointer, sharp at both ends. The seat for the ball must



A simple form of wiggler

be made of a size that will allow the ball to oscillate without permitting it to shake. The hole in the ball should be a push fit for the rod of which the pointer is made.

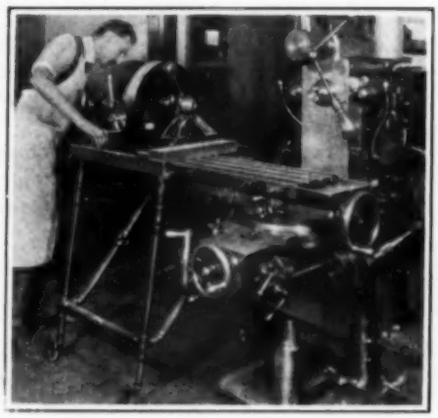
The ratio between the long and the short ends of the pointer may be varied at will by pushing or pulling the rod. With a 15-in. pointer set to show an inch or less toward the work, it may safely be assumed that when the long end is still, the center-dot, in which the short end rests while the work is rotating, is "true."

A Time and Labor Saving Truck

BY CLARENCE D. HANSCOM

The handling of heavy, movable equipment has always been a problem in shops. Small cranes or hoists, or makeshift expedients, have been the rule in many places. All these methods are slow and uneconomical, and frequently require the time of two or more men.

The Model Shop of the Bell Telephone Laboratories, New York, has solved the problem by the use of the simple and cheap truck illustrated herewith. The truck consists of an iron-pipe framework mounted on casters. It is open at the top, and has two parallel, horizontal angles, forming the bed. Two wood blocks placed cross-wise between the angles, act as supports for the work to be handled.



A convenient truck

In the illustration, a special dividing head is being removed from a milling machine. The truck has been rolled up astride the table of the machine, and the table has been run out until the dividing head is over the middle of the truck. Wood blocks are being placed beneath the dividing head and across the truck and the milling machine table will then be lowered until the head rests on the truck, when the latter will be rolled away.

Leveling Oil Stones

BY CHARLES DOESCHER

Here is a little shop kink that, while it is not new, happens to be one that the writer has not seen described in any of the mechanical papers.

Oil stones after continued use, become slightly hollow and uneven, and are not the efficient tools that they are intended to be unless they are leveled. A most simple and convenient method by which to true them is to take a cast-iron block that has been planed smooth, and lightly sprinkle it with No. 90 abrasive. The faces of the oil stone are then leveled by rubbing them over the block and applying the abrasive as needed, until the stone is leveled.

In this connection, it may not be amiss to say that the writer has found that kerosine oil makes an excellent lubricant when honing a die with an oil stone, since it prevents the stone from "loading," and helps it to take hold on a hard surface.

Obviously if the worker will be thoughtful and use his stone so it will be worn down toward the ends at about the same rate as in the middle the periods between necessary leveling will be much longer.

Practical Shop Problems

Questions of a Practical Nature will be answered in these columns

Marketing an Invention

Q. I have secured a patent on a valve lifter, which I maintain to be an improvement over those now on the market, and I desire to promote its manufacture and sale. I personally lack the necessary funds to proceed "on my own," but have sufficient confidence in the merits of the tool to prefer to await returns on the royalty basis rather than to sell outright for what I can get as a flat price.

I have approached several tool companies, and have been received with more or less reserve on their part when I have exhibited my hand-made model and my final patent papers.

Please advise me how to proceed to get the action I desire.

A. The requirement that will be at once imposed by the prospective manufacturer before he will consider taking on the devolpment, the tooling and the manufacture of any new article is that there must be but very little of the element of chance for him. The greater the initial investment he will be required to make, the more reserved will he become.

Your problem, therefore, is to prove to him, as well as to confirm your own beliefs, that this element of chance is actually negligible and that your estimate of investment is based on sound experience and not on conjecture. When you have solved this problem, you will have converted your own opinions, with which the average outsider is not particularly interested, into salable facts.

List all of the competing valve lifters and determine as nearly as possible the standing of each manufacturing company in the field.

Make a careful investigation that will bring out the size and location of the market for the tool, as well as the marketing channels that are followed by the manufacturers.

Make complete working drawings of your own valve lifter and secure estimates from several manufacturers on tooling to make it in lots of varying amounts, keeping the tool and production costs separate.

Ascertain the selling prices in each of the steps between manufacturer and user for the competing lifters and compare them with your own estimated costs to make and sell. Tabulate the results to find your own position in the field.

Make or have made a dozen lifters and distribute them in various establishments, checking their individual and comparative performance. Make notes of the weak points and secure written, supporting comment, both positive and negative, over the signatures of shop owners, buyers, agents and mechanics.

When you have completed this investigation, prepare a brief of the results without prejudice on your part and determine whether or not there is a favorable market from all standpoints that can be viewed fairly.

If there is advantage from a sufficient number of angles that can be interpreted to show practically assured profits, then approach a number of manufacturers with your proposition. Support each point with the proof you have at hand and have a sample to exhibit that looks as little like it was hand-made as possible. You should also have samples of the competing lifters and another of your own that have all been "through the mill."

The manufacturers best to approach will be those now making valve lifters, and preferably the one which will show from your investigation to be your second strongest competitor.

We admit that we have outlined a rather large order. We hold it to be the most certain way to prove there is no gamble for the manufacturer, proof that is essential if you are to receive consideration.

Goggles

Q. We have been referred to you in regard to a dimming fluid that can be used on goggles to prevent the accumulation of perspiration and dirt. Can you advise us concerning it?

A. There is a substance which can be obtained at the leading druggists and opticians for this purpose. Similar results also are said to be obtainable by the use of glycerine soap. The action diffuses drops of water or perspiration as they come in contact with the covered surface. We suggest that you try both and determine for yourself, which works to the best advantage.

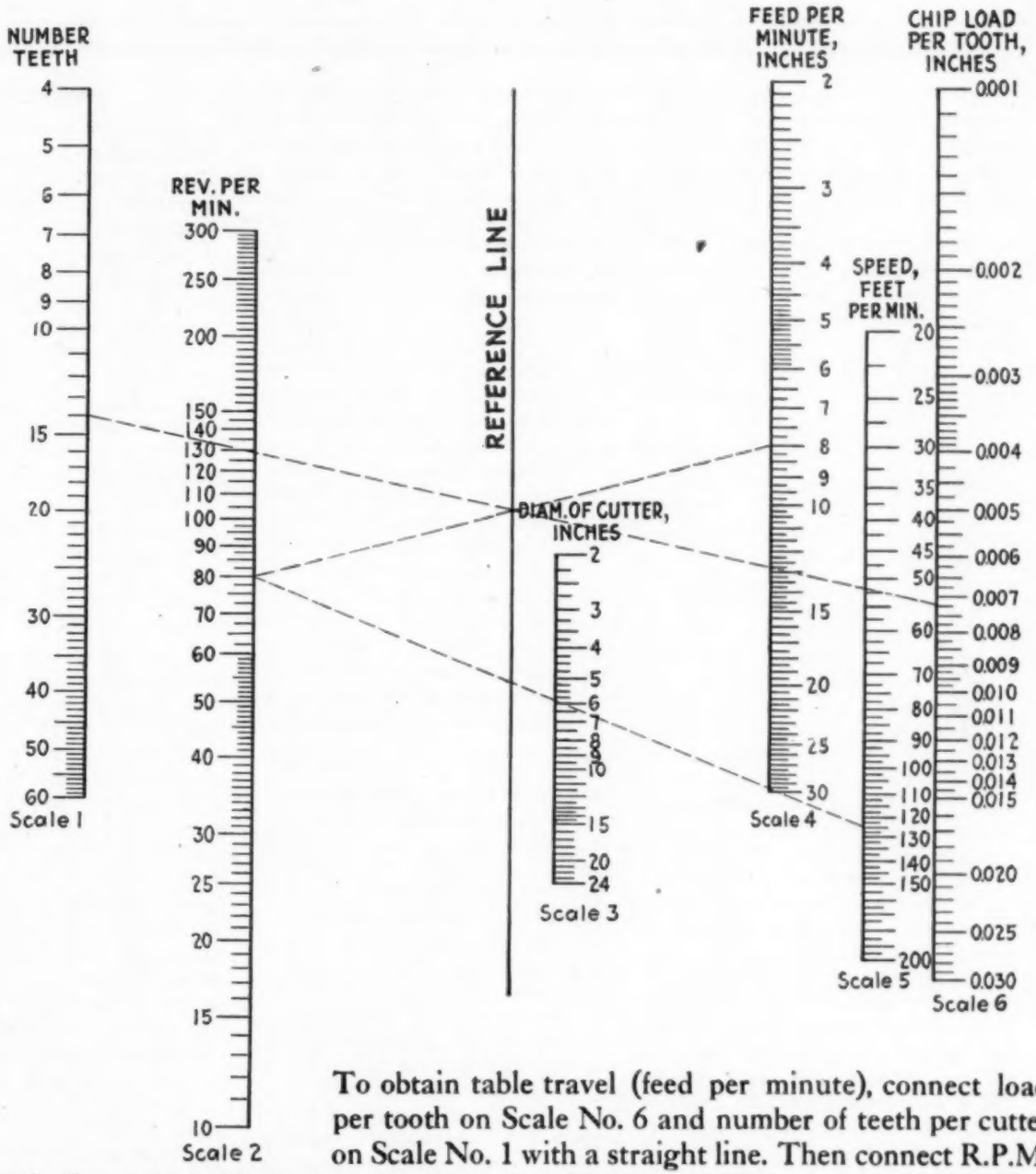
We also suggest that you investigate the construction of the goggles you are using to see that they are provided with adequate means of ventilation, as this will have a decided bearing on whether the glass will remain clear or not.

There is another condition that exists in many plants which acts against the use of goggles to advantage. This condition rests on giving a man a pair of goggles and then failing to keep a frequent check on them. If they are used for grinding, they will gradually become pitted on the outside from the abrasive action of flying particles. In welding, the same thing happens, except that the sparks actually burn the glass.

The average workman will not return them until the glass is broken out or the holding strap is gone entirely or the cages are ruined. For a considerable time he will have used them to the detriment of his efficiency as well as safety.

We strongly suggest that in every plant a duplicate supply be maintained and that steps be taken to secure a complete arbitrary change at least twice a week. Maintenance will be decreased, more efficiency and greater safety will result and actual savings in cost of goggles will be realized.

CHART FOR CALCULATING SPEEDS AND FEEDS OF SOLID AND INSERTED-BLADE · MILLING CUTTERS ·



To obtain table travel (feed per minute), connect load per tooth on Scale No. 6 and number of teeth per cutter on Scale No. 1 with a straight line. Then connect R.P.M. of spindle on Scale No. 2 through the point where the first line crossed the reference line and carry this over to Scale No. 4, which gives the feed in inches per minute.

To obtain chip load per tooth, connect feed per minute Scale No. 4 with R.P.M., Scale No. 2. Then connect number of teeth Scale No. 1 through point where first line crossed the reference line and read chip load per tooth on Scale No. 6.

To obtain speed in feet per minute connect R.P.M. Scale No. 2 with diameter of cutter Scale No. 3 and read speed on Scale No. 5.

To obtain R.P.M. connect speed Scale No. 5 with diameter of cutter Scale No. 3 and read R.P.M. on Scale No. 2.

Punch here to suit your binder

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Technical Abstracts

Nitrogen Casehardening

One of the greatest drawbacks to the extended use of casehardened parts in engineering practice is the distortion that occurs in objects so treated, especially if the heat-treatment subsequent to carburizing is such as to develop the best physical properties of the steel. Messrs. Krupp, Essen, Germany, have developed a process designed to overcome these difficulties. Briefly, the process consists of heating the articles, made of a special steel, to be casehardened, in a gas consisting mainly of ammonia at a temperature not exceeding 580 deg. C., and, when a sufficient depth of case has been obtained, of allowing the parts to cool down with the furnace. The time taken is lengthy, varying from 40 to 60 hours. As will be gathered from the composition of the gas, the process is one which impregnates the surface layers with nitrogen, instead of with carbon as is the usual practice. It has been known for a long time that if steel is heated in ammonia gas or in contact with nitrogenous substances, nitrogen is absorbed—either dissolving in the steel or forming iron nitrides. That such compounds are capable of adding materially to the hardness of steel in the quenched state, in similar manner to carbides, has also been known. The cyanide process for case hardening depends on nitrogen absorption in addition to carbon absorption. The depth of case was from 0.5 mm. to 0.8 mm. in different samples. Scleroscope figures varied between 104 and 108, indicating a hardness hitherto unobtained in casehardened work.—*The Metallurgist*, Supplement to the *Engineer* (England). Sept. 25, p. 140.

Electro-Sherardizing

C. H. Purdy of the Consumers Power Co., states that the rustproofing properties of a continuous coating of metallic zinc over iron or steel are well recognized. Four processes of applying this coating are in commercial use as follows: first, sherardizing; second, hot dipping or galvanizing; third, electrical depositing or plating; fourth, spraying by the Schoop process. Sherardizing may be defined as the process of growing metallic zinc onto the surface of iron or steel. The word "growing" is here used to differentiate the sherardized coating from that of a deposit or plating as obtained in the other three processes.

Sherardizing takes place at a temperature some what below the melting point of zinc. Theoretically, it consists of the condensation of zinc vapor in and on the surface of iron or steel. When iron is heated in intimate contact with zinc dust, the pores at the surface of the metal apparently become filled with zinc which condenses and is retained or occluded. Then on top of this occluded zinc there forms by adhesion a layer of metallic zinc. This gives to the electro-sherardized coating its remarkable tenacity.—*Fuels and Furnaces*. Oct. 1925, p. 1131.

Plant Lighting

A short time ago the General Electric Co. decided to improve the lighting conditions throughout its manufacturing plants and general offices. A committee held meetings at the main plants and inspected the lighting conditions, after which a meeting was held with the executive heads of the particular plant. This afforded an opportunity not only for discussing the relative conditions of the present lighting, but for selling to plant managers the idea of benefits to be derived from adequate illumination. The following table of foot-candle intensities for manufacturing areas was decided upon:

Manufacturing (fine detail)	15-20
Manufacturing (general)	10-15
Manufacturing (rough assembling)	6-10
Packing and shipping	4-8
Warehouse storage	2-4

A similar table for general office foot-candle intensities is as follows:

Accounting and clerical	10-25
Engineering and drafting	15-25
Commercial and sales	10-15

It was further decided that when an entirely new installation was made, regardless of the intensity that was required for the particular process or operation in this area at the time, sufficient wiring capacity and adequate control of circuits should be allowed to provide at least 3 watts per sq.ft. of floor space for lighting.

Some idea may be gained of the magnitude of an undertaking such as this when it is considered that it involved the analysis of the lighting requirements for 26,000,000 sq.ft. of floor area with varying types of buildings.—*Light*, Oct., 1925, p. 12.

Permanent Molds

Two great fundamental problems prevented the adoption and application of the permanent mold as readily to the production of iron castings as to the production of castings in the so-called white-metal class. One was the lack of suitable mold material and the second was the natural law that juggled the carbon in a highly disconcerting manner according to the temperature of the metal and the speed at which it was cooled. In the latest type of permanent mold the problem was attacked from a new angle, the mold being maintained at a reasonably uniform temperature. Examination disclosed that deterioration of permanent molds was due not so much to high temperature as to excessive fluctuations and uneven distribution of mold temperature caused by the intermittent pouring of highly heated molten metal into the molds. Pat Dwyer, the author of the article states that the solution of the problem was found in using a fluid such as oil with a fairly heavy body and a flash point above 400 degrees as a cooling medium for the molds. Each mold is designed with the proper number of sections, each with a hollow chamber adjoining the mold cavity and the oil is kept flowing through these chambers during the operating period. The extent of the cooling installation depends upon the character and number of molds to be served but a description of the equipment in use at the experiment station is typical and will serve for illustration.—*Iron Trade Review*, Oct. 8, p. 887.

American Machinist

Established 1877

KENNETH H. CONDIT AND FRED H. COLVIN, *Editors*

Waste of Men in Industry

ETHELBERT STEWART, a statistician of the Department of Labor, is credited with a slogan that ought to be a watchword in all manufacturing industries, "Men for skilled work—machines for drudgery." And it should also be extended to many other lines, such as construction of highways and railroads, the building of sewers and similar work.

Much has already been done but, according to Mr. Stewart, we have hardly more than started in the development and use of labor saving machinery. One of the greatest single incentives was probably the restriction of immigration. For as long as human labor is cheap enough, and takes care of its own depreciation, there is little incentive to develop and invest in expensive labor saving machinery.

We are going to see more and more labor saving machinery, and the world will be the better for it. But we must provide in some way for those who are thrown out of work during the transition period. It is manifestly unfair for society as a whole to benefit at the expense of those who are directly and vitally affected by the change.

As with all changes in industry the development of more labor-saving devices depends on the machine tool builder. The sooner all industry, and the machine tool builder himself, realizes this the better.

The Need of Efficient Transportation

IT IS difficult to appreciate to what extent transportation governs our activities, not to mention modern civilization itself. This is more true of the United States than of any other nation, owing to its widely scattered population, with the bulk of manufacture in ten states and the agriculture and many national resources in the remaining thirty-eight states.

The necessity for transportation is indicated by the fact that our transportation load is 4,300 ton-miles for each inhabitant every year. And this figure is increasing with the growing density of population in cities and the increase in the standards of living. There can be no question as to the need for efficient transportation, and the improved service being rendered by the railroads is a matter for national congratulation. Delays have been greatly reduced with the consequent releasing of large amounts of capital that would otherwise be tied up in stocks, both in stores and in transit.

Whoever renders a service to the community is entitled to adequate compensation, and it should be possible for well managed railroads to earn as great a return on the investment as any other public utility. Improved methods of management, such as more efficient loading of cars, larger cars and locomotives, together with longer runs for locomotives, have enabled the railroads to reduce costs and so increase earnings. Further improvements are doubtless possible and will be made as managers are more keenly alive than ever to the need for more efficient methods. They are also appreciating the need, and the value, of better relations with their customers, the shipping and traveling public. These improved relations will do much toward removing the antagonism that led to unjust legislation at times and will open the way to better conditions in every way.

An Unreasonable Want

A GOOD private employment agency recently endeavored to find a superintendent for a big machine shop. The advertisement specified a long list of desirable qualities in the applicant, qualities possessed by the ideal super but seldom all present in the human substitute. And the salary offered—was $4,000.

When one considers the amount of information, experience and executive ability needed to hold such a job, and the daily wage paid to plasterers, or plumbers, one is inclined to believe that the "want" of this company as measured by its offer is unreasonable.

Just Suppose

JUST suppose it was decided that the word "miscellaneous" and all the other words that mean the same thing were to be eliminated from the books of account and from the shop activities. It would take about two minutes to make the decision.

It would eliminate a handy dumping ground for expenses that are hard to explain, supplies requisitioned and wasted, time spent—dreaming, whole pages in the books of account, tedious searching through unclassified stores and a number of the unexplainable reasons for rising costs.

On the other hand, it would require the use of some thinking to classify intelligently, and would certainly expose some loose work on the part of individuals, and would require concentrated teamwork for a while to put it across, and good old Mike, who knows where most everything is, might not be needed.

Anyway, with all the miscellaneous things to tend to, the two minutes would be hard to find, but—

Just suppose.

Shop Equipment News

Davenport 5-Spindle "Non-Stop" Automatic Drilling Machine

The "non-stop" drilling machine, illustrated, has been developed by the Davenport Machine Tool Co., Rochester, N. Y., for work on small parts that require quantity production. Examples include automobile door hinges in which the pivot hole requires drilling and spring-shackle bolts which are drilled lengthwise to the center for oil distribution. The hanger holes in spring hangers and shackles and the test holes that must be drilled part way into stay bolts from both ends also represent work that can be speedily accomplished.

The drilling can be done from both ends of single pieces simultaneously, or from one end of parts set in pairs on the work-carrying fixture. The operations are performed continuously, and five pieces or sets of pieces are in process at one time.

The only requirement on the operator is to keep work supplied to the carrier as it rotates continuously past the loading point. The machine operations are automatic and include gripping the work, performing the drilling and discharging the completed parts.

The controls, three in number, are conveniently mounted at the front. A controller at the left-hand head is used to start and stop the drive motor. A hand lever, to the right of the controller, actuates a clutch to stop the otherwise continuous rotation of the work carrier and heads and the corresponding advance and retreat of the drills. A handwheel is connected to the carrier-rotating drive so that it and the heads can be rotated by hand when the clutch is thrown out of engagement.

The production rate is largely determined by the ability of the operator to keep the machine supplied. On the door hinge, for example, it is possible to place by hand approximately 1,600 pieces per hour, the machine having no trouble to take care of them readily.

Special loading attachments and conveyors for removing the finished parts as they are released from the carrier, can be supplied, to specification, when it is desired to increase the output over this figure. Special attachments can also be had for the carrier and are designed to locate and hold the pieces to be worked on.

The machine is shown in Figs. 1 and 2 set up and ready for drilling the shackle-bolt oil hole, with the exception of the guards that have been removed from above the work carrier and from the driving mechanism so the construction can be seen.

The machine consists of two five-spindle drill heads set to face each other and carried in housings upon a lathe-type bed. Referring to Fig. 1, the housing to the left is integral with the bed. The other housing is arranged so it can be moved along ways on the bed and secured in position for a given job by means of clamp bolts projecting through the housing from T-slots in the ways.

The work carrier is located between the heads and is doweled and bolted to them to form a single solid unit. This unit is rotated continuously in a clockwise direction, as determined by facing the machine at the right-hand end.

There are five flat faces on the carrier, one for each set of spindles, that are used to mount the work holders. In the case of the shackle bolt, on the set-up shown, there is a double-end V-block in the center and an angle piece at each end of the

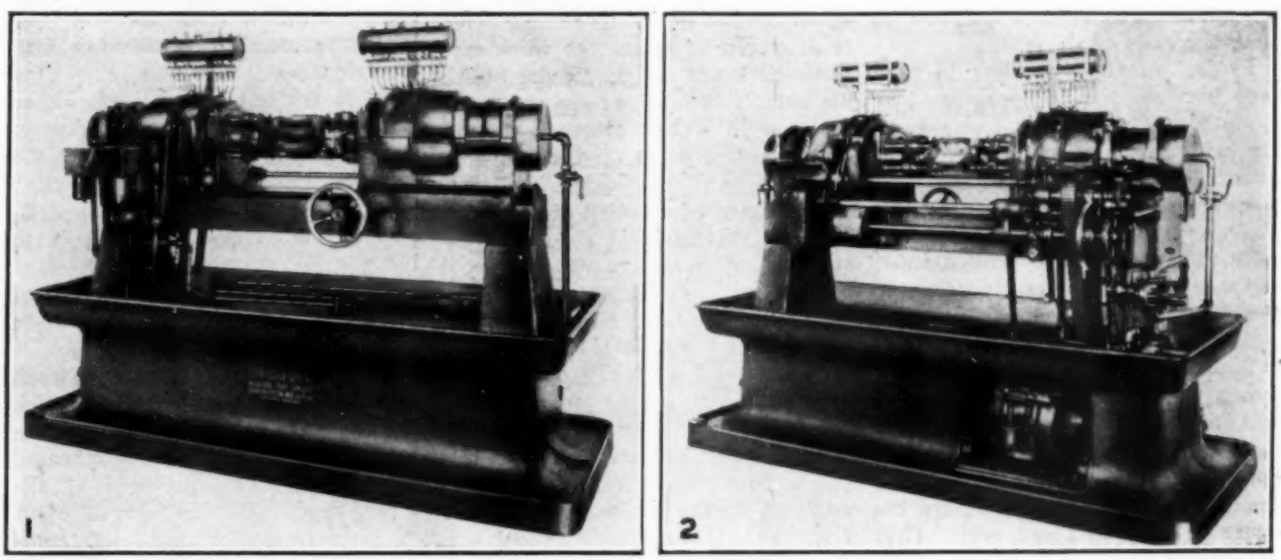


Fig. 1—Davenport 5-Spindle "Non-Stop" Automatic Drilling Machine. Fig. 2—A rear view with the guards removed

SHOP EQUIPMENT NEWS

carrier faces. These angle pieces are cut out on their standing legs to hold the hexagon heads of the bolts. Thus two bolts are carried on each face with the heads facing the drills.

The V-blocks are faced in the direction of rotation so they are vertical when they come to the loading position at the front, with the carrier face, on which they are mounted, standing in a vertical position. In this position, the pair of corresponding drills have been withdrawn to clear the ends of the bolts.

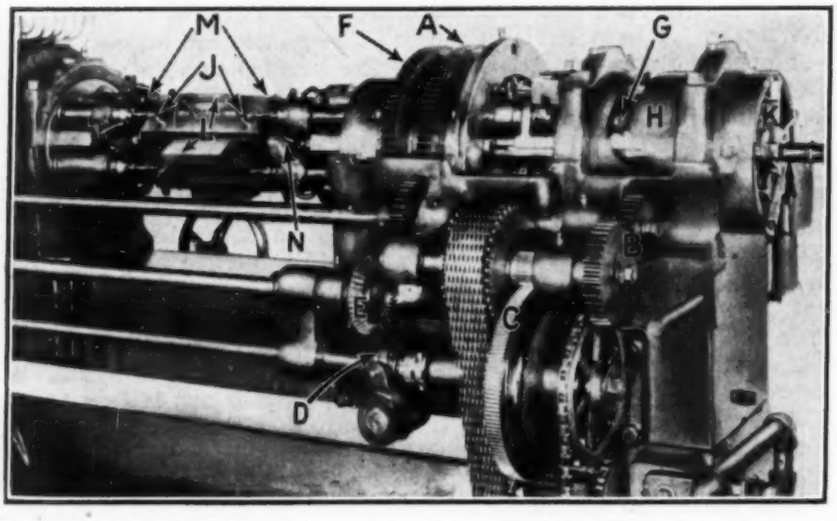


Fig. 3—A close-up view of the head with the covers removed

Projecting through slots in each face between the V-blocks and the angle pieces, a little to one side of the center line, there are two steel fingers, one for each shackle-bolt position. Lateral movement of these fingers is accomplished automatically to cause them to press against the shanks of the bolts, thus holding them securely in position.

At the unloading position, the lowest point reached by each face as it moves around, the fingers are automatically released and the work can drop out. They are held in this "open" position until slightly after the loading position is passed and the operator has placed new work. They are then closed again automatically and held so until, at the unloading position, they are once more drawn back.

Between the loading and unloading positions, the drills are advanced a predetermined distance, withdrawn to clear the chips, returned and again advanced to the end of the set travel, and then withdrawn to clear the work. Naturally, the withdrawal to clear the chips and the return to the bottom of the hole is done very rapidly.

The motor to drive the machine is mounted in the base and is connected to the drive mechanism, as shown in Fig. 2, by means of a silent chain. This drive divides in two directions from the shaft carrying the driven sprocket. One connects to the spindles through change gears so the drills can be driven at the correct speed for the work. The other drive is arranged to rotate the work carrier and heads and is provided with an independent set of change gears inclosed in a box attached to the machine bed back of the movable housing.

The speed of rotation of the work carrier and heads is regulated, by this set of gears, to conform economically with the depth to be drilled, the size of the hole and the material. This second drive also transmits power through a chain and sprockets to two coolant pumps, one for each head.

The coolant is contained in an amply large compartment in the base adjacent to the motor. It is lifted from there through independent suction lines to each pump and forced, under pressure, through the center of the head. It emerges through individual pipes between the drill spindles that direct it to individual drills. Return coolant falls to the large pan, cast as a part of the base, and flows back to the tank through a strainer.

Lubrication for the bearings and other moving parts is supplied as shown from two central reservoirs, sight-feed, distribution manifolds and tubing, so the flow to each point can be regulated according to its particular needs.

The bearing caps and protecting covers have been removed from one of the heads in the close-up view shown in Fig. 3, and the illustration has been lettered to assist in an understanding of the construction.

The construction of the head is essentially the same as that used in the company's 5-spindle "one-second" screw machine, previously described on page 714, Vol. 63 of the *American Machinist*.

The spindles are driven by the ring gear *A*, that, in turn, is driven from the shaft on which the change gears *B* are mounted. The shaft extends to a similar ring gear on the other head, the only difference being in an idler, interposed between the ring gear and its drive, to rotate the spindles in the head in the correct direction. The work carrier and the head-rotating drive is through the gear *C* and is controlled by the clutch *D*. The shaft on which the gear and clutch are mounted extends to the feed-change box at the left, but not shown in this illustration, and back through another shaft to bevel gear *E* that drives a worm meshing with the rotating-drive gear *F*. This drive is not duplicated in the other head, as the connection between heads is amply rigid to transmit the movement.

As the head is rotated, rollers *G*, mounted on slides that connect to the spindles, travel in their path laid out in the stationary double-faced cam *H*, with a result that is at once apparent.

The clamping fingers *J* on the work carrier are connected to shafts which extend through the head to the cam assembly at *K* and to a duplicated assembly at the outer end of the other head. In the course of a complete revolution, the latter cams or arms, one for each finger, are actuated to alternately move the fingers to grip and then release the work from the V-blocks *L* and the angle pieces *M*. At *N*, is one of the pipes for delivering coolant to the drill at which it is directed.

Jacobs chucks are regularly furnished with the machine, but other tool-holding devices can be had to specification.

SHOP EQUIPMENT NEWS

The company stands ready to consider prospective set-ups for the machine for any work within its intended range and through its engineering service can submit estimates on special work-carrying fixtures and handling devices. It will guarantee a production capacity for each part considered.

The machine will drill holes in steel, iron or brass ranging from the smallest up to $\frac{7}{16}$ in. in diameter. The maximum depth range is 2 inches.

Caulkins Full-Automatic Super-Sensitive Drilling Machine

The Caulkins full-automatic drilling machine has been developed by E. L. Krag & Co., 542 West Jackson Blvd., Chicago, Ill. It is a special machine that, in the form illustrated, is designed to drill cotter-pin holes in $\frac{3}{8}$-in. bolts. It can, however, be adapted readily to embrace any kind of sensitive drilling work where quantity warrants. Operation is automatic and continuous, and it is said that the operator's duties are few enough to allow him to tend to a number of machines. In fact, his duties are limited to keeping a hopper at the rear of the machine supplied with work and to replacing worn or broken drills.

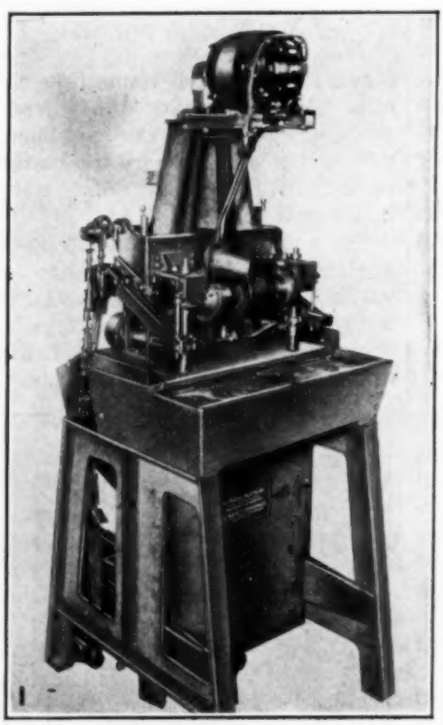
The spindle speed is reduced to a point about 24 per cent below customary practice. A feed of 0.004 in. per revolution is maintained. The spindles have a travel of slightly more than the diameter of the stock to be drilled.

The drive motor is mounted on a standard above the machine and drives to a main pulley below from which power is taken for the spindle rotation, the conveyor mechanism and the feed movements.

The feed drive is through a friction clutch that can be adjusted to drive a sharp drill through average stock. It will slip, however, when the drill gets dull or when the point strikes a hard piece of work. This arrangement is for the purpose of protecting the high-speed drills.

A special gage and an arrangement to facilitate changing, enables the operator to replace a worn or broken drill in a matter of seconds.

The idle machine time, between holes is limited to six revolutions of the working spindle.



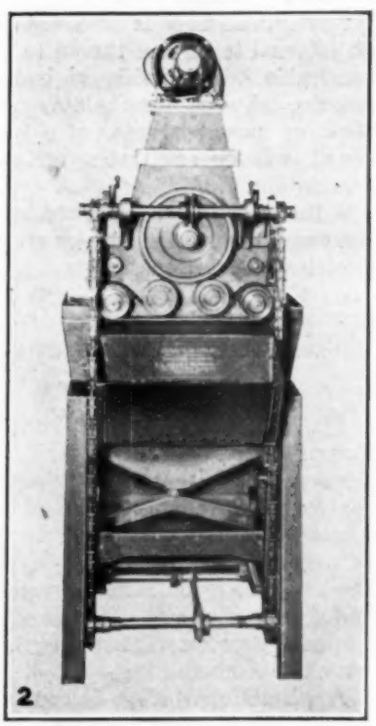


Fig. 1—Caulkins Full-Automatic Super-Sensitive Drilling Machine.
Fig. 2—A rear view of the machine

The machine can be built, to specification, to handle bolts up to $\frac{1}{2}$ in. in diameter, drilling one hole. Also the design of bolt having six holes in the head can be indexed and drilled automatically. It will also handle studs, pins, tubing and similar parts, drilling one or two holes. Washers can be burred on the machine, the set-up including drilling, countersinking, burring and indexing.

The machine is driven by a Western Electric $\frac{1}{3}$-hp. motor and is equipped throughout with Norma ball bearings. Its weight is 740 pounds.

With the individual drive mounted as shown in the illustration, the motor is placed in a position where the possibility of damage from oil and chips is remote.

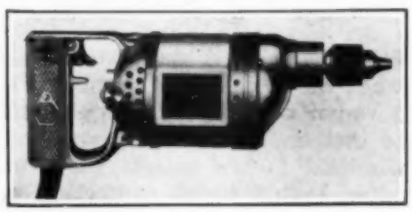
Black & Decker Heavy-Duty Drill, $\frac{1}{4}$-Inch

The Black & Decker Manufacturing Co., Towson, Md., has added to its line of portable electric tools the heavy-duty $\frac{1}{4}$-in. drill illustrated.

This model is not intended to take the place of the $\frac{1}{4}$-in. drill which has long been on the market and was described on page 742, Vol. 55 of the *American Machinist* but has been designed to supplement it.

The two drills are similar in general appearance, but the heavy-duty tool is built for more severe service and operates at a higher spindle speed than the regular model.

The motor can be operated on either a.c. or d.c. 110-volt current and rotates at 3,000 r.p.m. Additional ventilating holes are contained in the rear of the motor housing. The regular trigger switch is used.



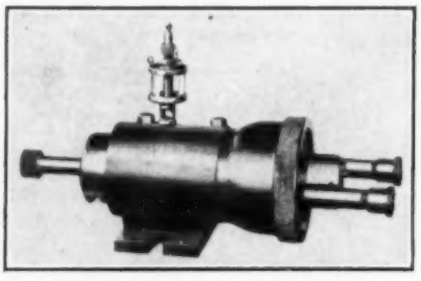
Black & Decker Heavy-Duty $\frac{1}{4}$-Inch Drill

The equipment includes a three-jaw geared chuck for straight-shank drills up to $\frac{1}{4}$-in. and 15 ft. of duplex electric cable fitted with an attachment plug.

SHOP EQUIPMENT NEWS

Ex-Cell-O Governor-Controlled Grinding Spindle Type-AD 1003

The type-AD 1003, governor-controlled grinding spindle is being manufactured by the Ex-Cell-O Tool & Manufacturing Co., 1469 East Grand Boulevard, Detroit, Mich. The spindle is air driven and operates on the same principle as the smaller sizes described on page 753, Vol. 62 of the *American Machinist*. The tool is intended for the grinding of holes from ¾ to 1 in. in diameter and is designed to maintain a constant speed whether the grinding wheel is cutting or idling between



Ex-Cell-O Governor-Controlled Grinding Spindle, Type-AD 1003

cuts. The spindle is applicable for bob-thread and worm grinding, center grinding (male and female) and for the driving of high-speed, diamond, cutting tools.

The governor functions through the medium of a valve that is operated by a relay and a solenoid. The governor mechanism consists of a simple pair of electrical contacts controlled by the spindle speed.

An adjustable idling valve maintains the speed at the desired point when the wheel is not cutting. The governor contacts are then adjusted so that the additional air supply is admitted to the spindle when the wheel begins to cut and when the spindle speed is reduced slightly below the idling speed.

All parts of the governor mechanism, including the valve, are designed so the wear is said to be negligible. It is claimed that since no delicate adjustments are required, these parts will remain in operative condition indefinitely. Electrical energy, which is required only while the wheel is actually cutting, is said to cost not more than one to two cents for eight hours of operation.

The spindle is designed for continuous operation at speeds as high as 30,000 r.p.m. With a pressure of 80 lb. per sq.in., the air-turbine motor developes rated speed, when idling between cuts, with a consumption of less than 12½ cu.ft. of free air per minute. The air consumption under cutting conditions will vary according to the diameter and face of the grinding wheel, depth of the feed and material being ground.

Since the turbine has only one simple rotating element, it can be given an accurate running balance that will improve the life of the grinding wheels. The high speed without vibration also makes it possible to use softer grinding wheels.

The spindle is equipped with the XLO high-speed, controlled, ball bearing to permit operation at high continuous speeds without adjustment or attention. As in the smaller non-automatic speed-control spindles, the exhaust air is circulated around the bearings to keep them cool and to make for longer life.

The spindle nose is provided with an internal taper and thread to take removable wheel quills of various lengths, chucks for holding solid stick or pencil stones, steel-insert pencil wheels and tools of other description.

A line drawing is furnished by the company to show the correct air and electrical connections.

Wilson-Maeulen Compensated Pyrometers

The Wilson-Maeulen Co., Inc., 383 Concord Ave., New York, N. Y., has developed an automatic electrical control for the compensation of thermocouple cold junctions for its line of pyrometers. Fig. 1 is a view of the company's indicating pyrometer and Fig. 2 shows the "Tapalog" recording pyrometer, both equipped with the compensating control.

A wheatstone bridge is connected in the thermocouple circuit. This bridge has four sections, three of which are composed of constant-resistance materials. The fourth section is of a material having a definite change of resistance proportional to temperature changes.

A dry-cell battery in the circuit furnishes current which is regulated by the resistance change in the bridge to correct the thermocouple current in accordance with the changes of temperature in the thermocouple cold junction.

A rheostat is placed in the battery circuit to adjust its current and

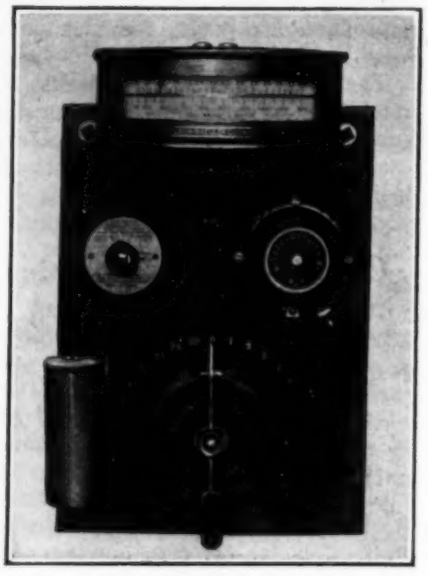


Fig. 1—Wilson-Maeulen Compensated Indicating Pyrometer

a convenient switch connection permits the checking of the rheostat adjustment, using the pyrometer galvanometer to measure the battery adjustment to a check point on the instrument scale.

The compensator is flexible in its application and instruments of various ranges or scales can be interchanged on the same type of thermocouple. It can be applied to different types of thermocouples if

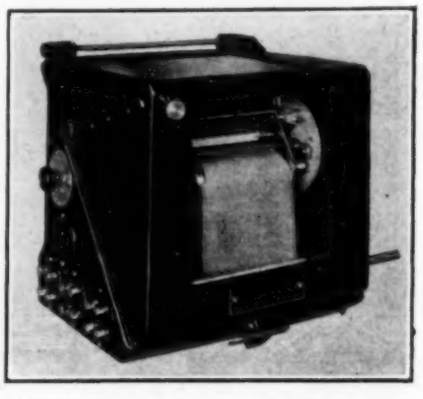


Fig. 2—"Tapalog" recording pyrometer equipped with the compensator

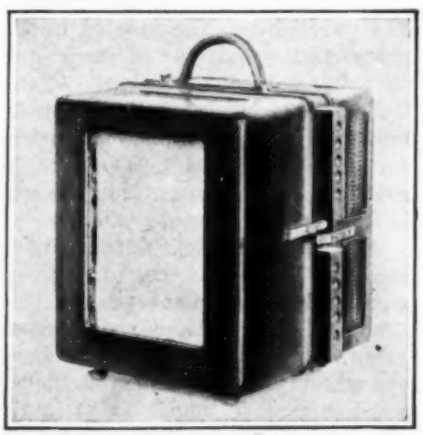
separate compensators are used for each type. A single compensator may be used on a combination of the indicating and recording pyrometers.

SHOP EQUIPMENT NEWS

General Electric Portable Curve-Drawing Polyphase Wattmeter

The General Electric Co., Schenectady, N. Y., has introduced a line of self-contained, portable, curve-drawing ammeters, voltmeters, single-phase and polyphase wattmeters. The instruments are made in two types, the CP-4, equipped with a Chelsea clock paper drive and the CP-5 equipped with a Warren motor. The type CP-5 wattmeter is shown in the accompanying illustration. With these instruments, chart speeds of one, three, six or twelve in. per hr. can be obtained. They are equipped with a gear shift which changes from inches per hour to inches per minute or vice versa.

The meters are high-torque devices in which damping is said to be unaffected by temperature and to be sufficient for rapidly fluctuating loads such as in electric furnaces. The pen points have sufficient force



General Electric Portable Curve-Drawing Polyphase Wattmeter

to minimize the errors resulting from friction and the reroll cannot be damaged by pulling out.

The element is assembled on a cast aluminum-alloy frame which carries the armature, field coils, iron core and shield, inkwell and pen.

The instrument frame is, in turn, mounted on a main frame to which the front and back covers forming the case of the meters are hinged. The main frame also carries the chart-carriage assembly, mercury damper, potential switch and terminals. The covers are of cast aluminum alloy.

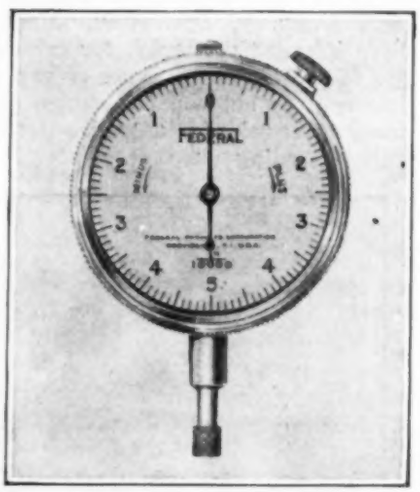
A potential resistance is mounted in two ventilated compartments in the back cover and is separated from the instrument proper by bakelite panels. The construction is such that the potential circuit is broken at the terminals when the back cover is open. Persons operating the instruments are thus protected from high voltages. The chart carriage is hinged at the bottom and can be tilted forward to facilitate the installation of new charts.

The voltmeters and potential circuits for the wattmeters are triple-rated at 110, 220 and 550 volts and the ammeters and current circuits of the wattmeters are rated up to 20 amperes. The instruments are small, light in weight, of high voltage capacity and have small internal losses.

Federal Dial Indicator Model 30

The Federal Products Co., 15 Elbow St., Providence, R. I., has brought out a dial indicator, to be known as the No. 30, which is especially adaptable to the inspection of work where the variations in thickness or diameters must be held within minute tolerances or where close comparison is necessary.

The indicator has all the features of the Federal type of gage. The dial is graduated to read in increments of 0.0001 in. above and below



Federal Dial Indicator, Model 30

the zero line. One complete turn of the pointer represents a movement of but 0.010 in. at the measuring spindle.

Whitman & Barnes "Hercules" Drills, Nos. 555 and 444

Modifications have been made in the line of "Hercules" drills produced by the Whitman & Barnes Manufacturing Co., Akron, Ohio. The taper-shank model is No. 555 and the straight-shank drill is No. 444. Oil-hole models in the line are

Whitman & Barnes "Hercules" Drills Nos. 555 *and* 444

Nos. 555-H and 444-H. They can be had in carbon or high-speed steel.

The original "Hercules" drills were made with a hub at the large end of the shank. For certain jig work and in multiple-spindle presses this hub was objectionable, however, and a process has since been developed by the engineers of the company by which the hub has been eliminated.

The drills are processed and twisted hot, but the flutes are milled to combine accuracy with strength. The over-all and flute dimensions correspond, size for size, throughout the carbon and high-speed lines.

Gilmer All-Cotton Packing

The L. H. Gilmer Co., Philadelphia, Pa., has added to its line of fan belts, automobile upholstery materials and webbing products, an all-cotton packing made especially for use in connection with low-pressure steam. It can be used for such purposes as sealing when a lid is frequently opened or closed and a packing is required.

It is claimed, for this packing, that it retains its elasticity and resiliency for a long period of time under such service. The packing is free from all coloring or mineral substance that might run and discolor liquids or steam coming into contact with the material. In this connection, the material will serve well where the coloring matter and mineral ingredients of rubber packing make its use undesirable.

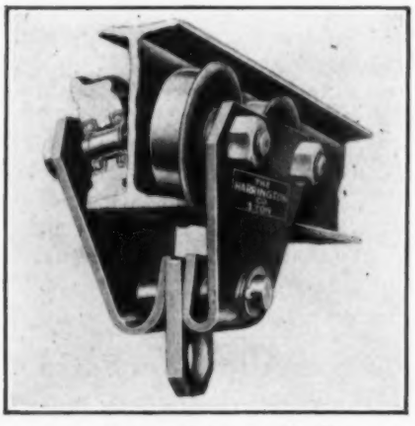
SHOP EQUIPMENT NEWS

Harrington I-Beam Trolleys Models D and C

Two styles of I-beam trolley of which a model D is illustrated, are being manufactured by the Harrington Co., 17th and Callowhill Streets, Philadelphia, Pa. They are intended for rapid and easy moving of material suspended from an I-beam track.

The parts on the model D, with the exception of the wheels, are made of steel. The side frames are cut from heavy plate and are bent inwardly at their lower ends to provide a support for the link pin without making use of castings or rivets. The sides flare out at the same angle as the beam flange so the straight-tread wheels can bear over the full width of their faces.

Cup and cone-type ball bearings with chrome-nickle steel balls running in hardened races are included in the design. There are two bearings in each wheel. Because of the flexible connection between the side plates and the link pin, the load is evenly distributed on all of the wheels.



Harrington I-Beam Trolleys Models D and C

Spacing collars, 6 in number and each $\frac{1}{8}$ in. in thickness, are provided between the side plates. Retaining cotter pins hold them in place. By the removal of these collars, the width of the unit can be increased to fit the trolley to beam flanges that are wider than standard. Special long pins and spacing collars, beyond the range of the washers, can be furnished to specification.

When desired, the link in the trolley can be replaced by a combination link and stud to engage the frame of the hoist, in place of the customary hoist hook, to conserve lifting space.

The model-C trolley has straight side frames of rolled-steel plate and curved-tread wheels of large diameter. Each wheel is equipped with two high-duty ball bearings. The trolley can be furnished in a plain design or with a geared handwheel and pendant drive chain. Sizes up to that of 4-ton capacity are furnished with adjustable collars so they can be widened for beams with $\frac{3}{4}$ in. wider flanges than standard.

The model-D trolley is built in four sizes of $\frac{1}{2}$, 1, $1\frac{1}{2}$ and 2-ton capacity and are intended for use on I-beam tracks measuring 5, 6, 6 and 8 in. respectively. With the provision for widening, they can be used respectively on 8-, 9-, 9- and 12-in. I-beams. Their weights range from 33 to 83 pounds.

The model-C trolleys are built in 13 sizes with a capacity range between $\frac{1}{2}$ and 20 tons. Those of 5-ton capacity, and larger, are built to order.

Van Norman "Super-Franklin" Universal Valve and Cutter Grinder

The valve and cutter grinder, illustrated, is known as the "Super-Franklin" and is being manufactured by the Van Norman Machine Tool Company, Springfield, Mass. It is intended primarily, for grinding the valves for all types of gasoline engines but can be adapted to many other kinds of valve- and cutter-grinding purposes.

The machine is portable and is a self-contained unit mounted on a rigid cast-iron base through which holes are provided for bolting it to a bench.

It is equipped with the collet method for holding valve stems and pilots, with the spindle fitted in a swivel head that is mounted on a compound cross-slide. When desired, a 3-jaw universal Jacobs chuck can also be furnished, with a maximum capacity of $\frac{3}{8}$ in. in the place of the collet.

The grinding-wheel arbor is mounted on ball bearings and provision is made for adjusting for wear. The compound slides are operated by hand-feed screws for moving the work to and across the face of the grinding wheel. These slides are accurately scraped and are fitted with adjustable gibs to take up wear.

The spindle in the swivel workhead is driven by a worm and wormwheel through a flexible-shaft device. All of the spindles are accurately mounted to fit the bearings. The swivel head is graduated in degrees and provision is made for clamping it in any position.

A carbon-cleaning wire brush is mounted on the wheel-spindle arbor for cleaning valves preparatory to grinding them. The grinding wheel is 5 in. in diameter.

A V-shaped block is furnished for coning or facing the ends of flattened out or burred valve stems. The $\frac{1}{4}$-hp motor is inclosed and is dustproof. It is mounted to belt drive the wheel spindle and a belt-tightener arrangement is added to maintain the proper tension and contact on the chuck-rotating spindle.

"Super-Franklin" Universal Valve and Cutter Grinder

News of the Week

Manufacturers in Convention Urge Reform in Taxation and Immigration Laws

Edgerton makes keen analysis of business conditions

The reduction of taxes, national, state and local, and a more intelligent administration of the immigration law, formed the important part of the discussions at the thirtieth annual convention of the National Association of Manufacturers, held in St. Louis, Oct. 26, 27 and 28.

The association's committee on taxation made its report, which was a most interesting survey of the tax problem, with recommendations for relief measures. This committee was headed by W. H. Alford, of the Nash Motors Co.

"The controlling purpose of American taxation should be to produce a permanent flow of revenues to meet necessary requirements of our government, economically administered, and not to effect or enforce social reform," the report stated.

Urge Tax Reforms

Among the reforms urged were: That re-examination and reform of the federal tax system should accompany immediate equitable reduction of rates.

That the federal government abandon the field of estate taxation to the states and re-enter it only during a national emergency.

That the gift tax be repealed.

That the so-called publicity provisions of the revenue act of 1924 be substantially amended, so that free and general access to income tax returns be confined to the fiscal committees of each House in executive session, and that provision for the publication of the amount of income tax paid by each person be repealed.

That Congress further reduce so far as is practicable, the special excise taxes upon manufacture recognized as necessary war measures and correspondingly, the so-called nuisance taxes.

That Congress require abandonment of restriction within its appropriate limits of competitive manufacture and service by government business organizations and repeal the restrictions now imposed upon management of army and navy plants which prohibit employment of the most commonly recognized methods of ulating and adequately rewarding labor therein and improving the method of handling their material.

That Congress exempt from income taxation the compensation paid employees of American business organizations whose service requires them to reside in foreign countries.

That further endeavor be made to improve tax administration by constantly separating the judicial function of assessment from the administrative function of collection.

A recommendation for the creation of a standing immigration committee, composed of the secretaries of Agriculture, Commerce and Labor, to recommend to the President modification of the present restrictions on immigration "when the economic situation requires," was made by the association's Committee on Immigration.

General approval of the present quota restrictions was expressed, but it was suggested that when, in the opinion of the secretaries named, an emergency existed, the President should be asked to issue an executive order that the fixed monthly quota be extended or restricted for periods of six months.

"The net effect of such a policy would be that over a five-year period the full extent of the present quota restriction would be had," the report declares, "and for relatively short periods, the rate of immigration would be increased or decreased, always within the quota but providing a flexibility which would control the rate of admissions within the ascertained capacity of industry and agriculture."

Edgerton Analyzes Business

One of the features of the convention was the annual address of John E. Edgerton, president of the association. Mr. Edgerton, a forceful speaker, touched on various phases of industrial activity but his analysis of business conditions was particularly good. He said in part:

"If industry constituted an independent unit in our national life, and if economic factors were all that were involved in the consideration of its welfare, I confess that at the present time there seems to be little on the surface of things to worry much about. On the whole, business is good and getting better. There is almost a minimum of involuntary unemployment. Wages, both nominal and real, are still the highest paid in the entire world. There was never so relatively little conflict between employer and employee, and their relations were, perhaps, never before so cordial and free from misunderstanding. The strike in the coal industry is not to be considered other than as the operation of a well entrenched habit, the underlying cause of which and the chief issue involved being the infamous check-off system. The clash does not seem to be between the rights of men so much as between their ambitions; and the question, not what is economically and morally just to all concerned, including the public, but whether or not one man or a small group of his kind can control the industry.

"The vaults of our banking institutions are literally teeming with restless, discontented money looking timidly but eagerly for unhypothecated, panic-proof, deflation-proof securities in the ratio of two to one, or for fee-ridden loans on the relatively small unmortgaged portion of the nation's soil, or for mammoth speculations in gigantic combinations offering opportunities for gain stripped of all visible danger to the agencies of pillage. The very strange but consoling feature of a situation like this is the copious showers of unprecedented philanthropy, which run off into compensating moral benefits to the citizenry. But however stimulating this is to the imagination, it is not an entirely wholesome condition.

"Crop reports and statistical information of other kinds touching prices and prospects indicate very gratifying improvement in the agricultural situation, and a much happier atmosphere in that field where economic law has been encountering some of its most stubborn resistance. Following this release of pressure upon the economic mind, there should and, perhaps, will be at least a temporary recession of the socialistic tide of proposals from that source. Our transportation facilities appear to be taxed to the limits of their capacity; and in that sector of our economic life, there is nothing to invite immediate alarm except the always present possibility of an offensive political invasion."

Immigration Figures for July Just Released

The figures for July, 1925, show 32,767 aliens admitted to the United States, of whom 18,590 were immigrants coming to stay permanently and 14,177 non-immigrants coming for a temporary stay. In the same month 26,499 aliens (8,784 emigrant and 17,715 non-emigrant) departed, resulting in an increase to our alien population for the month of 6,268. During the same month, 2,000 aliens were debarred from entering the United States, and 919 were deported therefrom.

Canada, Germany, Mexico, and Irish Free State, in the order given, were the principal countries from which the immigrant aliens were admitted in July, 1925, 70 per cent of the total coming from these four countries. Italy was the principal country to which emigrant aliens departed, 2,149, or 24 per cent of the total, leaving with the intention of residing in that country for one year or longer.

Machinery Manufacturers in Germany See Little Prospect of Improvement

High foreign tariffs, lack of capital and scarcity of labor

July and August were exceptionally poor business months for the machinery industry, according to the latest report of the German Machinery Manufacturers Association. Domestic orders declined during August over the previous month with little prospect of improvement in the near future; whereas during the previous year the passage of the Dawes Plan and the consequent inflow of credit gave the expectation of improved business. Today there is no such expectation. It is more probable that the German economic life is entering upon a long period of depression. The adverse position of the machinery industry in August was noticeable in practically every branch. For machine tools a number of the most important buyers have practically disappeared from the market, including the heavy iron and steel industry, locomotive builders, railroad car builders, railway construction, and shipping. An exception is the automobile business.

In addition to the handicaps to exports on account of foreign tariffs, which are now subject to negotiation by the foreign office, the high production cost and above all lack of capital, are the principal difficulties in business.

The expansion of the industrial crisis has been characterized in the machine industry by the slackening of orders. The average working day of the factories, which since the end of 1924 has remained practically unchanged, was decreased by about two hours per week.

The lack of capital makes impossible an attempt to equal the credit terms of foreign competitors. Therefore, cheaper prices must compensate for the less favorable terms. An official reduction of the price for castings, the most important semi-finished material of the machinery industry, did not take place. The German machinery industry was adversely affected by the failure to conclude favorable commercial agreements with France, Italy and Poland and by the denunciation of the treaty with Spain.

In general, the above situation is confirmed in reports from Commercial Attaché Herring, who also speaks of labor difficulties, and it will be noted that the German machinery industry is experiencing difficulties that form a very sharp contrast to the active business it enjoyed during the period when the mark was depreciating.

The machine industries, particularly the more technical branches, are now feeling the full effects of the war and inflation conditions affecting skilled labor. During the war there was an inevitable discontinuance of the apprenticeship system, which previously insured a regular and adequate supply of skilled labor for the various branches of German industry. During the inflation period the apprenticeship system further suffered by the very slight spread between the pay of skilled and unskilled workers. The German Machinery Manufacturers Association recently called attention to this very unsatisfactory situation, which is now being gradually remedied.

Business in the machine tool branch is dull except for one or two special lines. Textile machinery producers are complaining about increased British competition in the export markets but domestic orders have increased somewhat. Prospects seem to be good for agricultural machinery as there is a prospect of a record-breaking harvest. Wood-working and saw mill equipment is in small demand, and the production of heavy motors, hoisting machinery and transportation equipment is being sharply curtailed.

The machinery industries are thoroughly dissatisfied with the long delay in negotiating and adopting commercial treaties with countries offering an important market for their products. It will be recalled that in Spain, Italy, France, the British Dominions and elsewhere, German goods are now or have been subject to higher tariff duties than those from competing countries, and the machinery industries hope to increase exports materially when the existing discriminations are removed.

American Machine Tools Preferred in Great Britain Because of Accuracy

Market will grow with recovery of British industries

Competent members of the machine tool trade in Great Britain estimate that not less than 10 per cent of the machine tool equipment in British plants is of American manufacture, says a report to the Department of Commerce. In some lines of production, as for example the automobile and electrical goods industries, the percentage would range much higher—up to 25 or 30 per cent—but the average for all plants would not be lower than the 10 per cent figure.

This is particularly interesting and significant when it is remembered that the manufacture of machine-tools is an old and well established domestic British industry, and that American, or other foreign products of a similar nature, must compete with a highly developed home trade that is carefully organized throughout the British Isles. Considering that Germany and some other countries, notably France and Holland, also do an important machine-tool trade with Great Britain, and that until the past year the exchange feature has been in favor of German trade and against American participation, the percentage of American equipment now in use may be regarded as extremely high and very satisfactory.

During the past four years American participation in the British machine-tool trade has also had to face an unprecedented depression in the British engineering industries, which, of course, are the principal purchasers of machine-tool equipment. Yet the fact that American participation has been not only maintained, but has shown steady progress as is evidenced by the fact that imports of American machine tools increased from £239,269 in 1922 to £278,585 in 1923 and to £341,688 in 1924. Sales of German machine tools made a perceptible advance in 1923, rising from £131,116 in 1922 to £157,002, but showed a considerable falling off in 1924, dropping to £139,824. Imports of machine tools from all other countries totaled £53,019 in 1922, £64,035 in 1923 and £71,916 in 1924.

During the eight months, January to August, 1925, inclusive, British machine-tool imports totaled £476,379, compared with £383,985 for the same period in 1924 and £314,086 during the first eight months of 1923. The United Kingdom was again the best customer for U. S. exports of metal-working machinery for the first six months of 1925, taking a total value of $2,036,938 as against $1,560,250 for the same period in 1924. Details of imports by other countries of origin for the present year are not yet available, but the increase on total imports bears out the opinion of the trade early in the year that 1925 would continue to show the steady improvement in demand that 1924 showed over 1923. Undoubtedly the present year's increase is mainly attributable to increased sales of American machine-tool equipment, as, since the stabilization of the German mark, and the partial elimination of the price advantage gained by Germany through a depreciated exchange, imports from that country have steadily declined.

A careful inquiry as to what types of American machine-tools meet with most success in the British market shows that special grinding machines, gear cutting machines, multiple drills, special machines for crankshafts and multi-cut lathes are now enjoying the best sales. The bulk of sales in American metal working machinery parts are made in chucks, drills, taps, reamers and dies. These latter are sold not only for use on American machines, but, in many instances, because of their superior accuracy, are employed on machines of British, German or French origin used in British plants.

Practically all dealers in American machine tools in the British market stress the point that the American tools are, in nine cases out of ten, demonstrably more accurate than those of any other nationality. Dealers use this argument as one of their chief "talking points" in promoting sales, and have found it justified so often as to be, by now, an almost universally accepted fact. For this reason, Ameri-

can machine tools and parts, of even old-established and practically standardized lines, sell well in Great Britain in competition with well-known domestic makes. American machine tools for such specialized work as automobiles, railway shop, and locomotive equipment, electrical goods, and agricultural implements and machinery, are regarded in the British market as the most advanced of any nationality. Distributors handling the American lines state that they create interest and make sales chiefly through their ability to demonstrate the efficiency of the American products; their saving in labor, and their extreme accuracy. Efforts in this respect are greatly assisted through the fact that large quantities of such equipment were imported into Great Britain from the United States during the war, and British producers in engineering trades became familiar with modern American machine-tool equipment and what it could accomplish in an efficient way even under the stress of mass production.

There has been a steady improvement in some of the British engineering trades—notably the automotive industries, and the electrical trades since the advent of radio—during the past 12 months. British machine tool makers and importers of foreign makes have accordingly increased their sales to plants engaged in those industries. Other lines of engineering, with the exception of shipbuilding, also show sufficient improvement to encourage the machine tool trade. Distributors of American lines of machine tools are therefore looking forward to an increased volume of business, and undoubtedly imports for the present year will be the heaviest since the war. British manufacturers may be expected to offer keen competition and substantial German competition must be faced. But American machine tools, particularly specialized lines and pneumatic tools, enjoy the highest reputation in the British market. Thus by keeping prices as low and stable as possible there seems little doubt that American participation in the British machine tool trade will maintain a steady advance in keeping with the recovery of British engineering trades.

American Welding Society in Convention at Boston

The most successful convention ever held by the American Welding Society took place October 21 to 23, at the Massachusetts Institute of Technology in Boston with over three hundred members and guests attending the technical meetings and several thousand taking the opportunity to inspect the exhibitions of twenty-five manufacturers of welding machines and equipment. The demonstrations of the exhibitors were of a practical nature, showing how welding equipment is used in the manufacture of commercial products. At the annual banquet Mayor James M. Curley, of Boston; Professor E. H. Miller of M. I. T., Professor Elihu Thomson of the General Electric Co., Professor C. A. Adams of M. I. T. and Professor A. S. Kinsey of Stevens Institute were the speakers.

At the technical sessions several important papers were presented. "Arc Welding as a Manufacturing Process" was the subject of a paper by H. M. Hobart of the General Electric Co., and W. Spraragen, secretary of the American Bureau of Welding. The paper reviewed some of the more prominent applications of arc welding in manufacturing processes such as on locomotive boilers, transformers, motors, pole piece assembly, commutator shells, motor bases, generator stator frames, oil pans, oil circuit breakers, steel castings, furnaces, etc. The extent that arc welding is used by the General Electric Co., the Westinghouse Electric and Manufacturing Co., the Lincoln Electric Co. and the Western Electric Co. was described in detail. It has been the experience of all these companies that the various arc welding applications as used by them have decreased the cost of product, increased production, improved the quality of product and overcome manufacturing and other difficulties.

The extensive use that welding has in the assembly of all-steel automobile bodies was described by J. W. Meadowcroft, of the Edward G. Budd Manufacturing Co., Philadelphia. This company was the first to adopt this method for manufacturing all steel bodies. In the design of these bodies, much stress is laid on the design of the parts so as to secure the necessary rigidity into a minimum number of pieces so as to facilitate their ready assembly in the jigs and fixtures for welding. Welded joints and seams do not break open, nor do the metals wear upon each other, thus squeaks and noises are eliminated.

Half Million Increase in Exports for September

Exports of metal-working machinery for September, with revised comparative figures for September, 1924, as compiled by the Department of Commerce, are as follows:

	Sept., 1924 Value	Sept., 1925 Value
Lathes	$78,757	$183,401
Boring and drilling machine tools	49,466	47,684
Planers, shapers and slotters	17,145	23,574
Bending and power presses	33,908	69,151
Gear-cutting machines	19,088	68,926
Milling machines	70,440	107,630
Thread cutting and screw machines	33,299	116,435
Punching and shearing machines	2,937	6,392
Power hammers	35,481	3,717
External grinding machines	94,669	137,345
Internal grinding machines	13,206	65,167
Other grinding and sharpening machinery	26,827	42,837
Chucks for machine tools	27,197	25,259
Reamers, cutters, drills, taps, dies and other metal-working tools	120,832	217,467
Pneumatic portable tools	58,684	88,861
Foundry and molding equipment	79,627	49,568
Other metal-working machinery and parts of	334,623	370,891
Metal-working machine tools (total)	$1,096,186	$1,624,305

Common Sense in Advertising Theme of Convention

Cutting the high cost of selling by applying common sense methods to advertising and advertisements was the central theme which formed the pivot for discussions at the fourth annual convention of the National Industrial Advertisers Association at the Hotel Chalfonte, Atlantic City. The sessions closed on Oct. 21.

Principal speakers included Julius S. Holl, president of the association; Bruce Barton, president of Barton, Durstine and Osborn; F. J. Petura, general purchasing engineer of H. L. Doherty & Co.; T. H. Dauchy, assistant sales manager of the International Nickel Co.; Edward Fenton Carley, advertising manager of the explosives department of E. I. du Pont de Nemours & Co.; Malcolm Muir, vice-president of the McGraw-Hill Co., and new president of the Associated Business Papers, Inc.; and Edward J. Mehren, vice-president and chairman of the editorial board of the McGraw-Hill Co.

President Holl and Mr. Barton spoke at the first session. Mr. Barton stressed the importance of common sense in advertising; pointed out that manufacturing costs inevitably will go down and showed that distribution costs must go up. Mr. Petura, discussing "What the Purchasing Agent Seeks in Industrial Advertising," showed the value of the industrial, business or class publication in helping the purchasing agent to select the concerns whose products he believes will serve him best.

"The Tie-Up Between Advertising and Sales Departments" was the subject discussed by Mr. Dauchy. He stressed the importance of such a tie-up and cited specific instances of co-operation in sales and advertising.

Mr. Carley outlined for his hearers the details of the plan by which advertising is telling the story of du Pont explosives to students in engineering schools. Mr. Mehren spoke on the subject of "The Editor's Responsibility to the Advertiser." Speaking of the industrial, class or business paper, Mr. Mehren stressed the fact that a publication's standing and value may be gaged from the strength of its editorial conduct. He showed the editor's responsibility in the matter of getting the complete confidence of subscribers to his paper in order, for one thing, that the advertising could have the fairest possible chance.

Mr. Muir's talk came in connection with his leadership at the morning session on Oct. 21 in the general discussion under the topic "Why Go At It Hit or Miss? He pointed out that the rule-of-thumb methods of sales have been relegated permanently to the past, just as rule-of-thumb in production has been replaced by engineering practice. Mr. Muir warned the association that research and all the figures which can be developed out of it are not a panacea for all industrial sales ills. The important thing to do, he said, is to set the objective, get all of the facts available and be sure the facts are properly interpreted for use in sales.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By Theodore H. Price
Editor, *Commerce and Finance, New York*

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MANY are coming to think that the continued advance in the stock market is the result of inflation, which is a word that few can define, although most people think they know what it means.

If it connotes a superabundance of lendable credit that is available for the purchase of stocks and commodities, then there may be some truth in the claim that the almost uninterrupted rise in the stock market is due to inflation. But until recently this theory has been inconsistent with the inactivity in the commodity markets, and the declining tendency shown by cotton and grain, our two most important staples.

Therefore, it is interesting to observe that grain was stronger last week and that the cotton market has shown great resistance to the influence of the increased crop estimates that have been in circulation since the government published its last "guess," in which the yield of American cotton for this season was put at 15,226,000 bales.

If we are to have inflation, or reinflation in the United States, it can hardly be expected that it will be limited to the stock market. And as a further advance in securities upon their merits as investments seems illogical, the most reliable indication of the future is probably to be found in the tendency shown by the prices at which the consumable staples of civilization change hands.

Until recently, the commodity markets have been held in check by the hand-to-mouth policy that most American business men have adopted. But there is some indication that the persistent buoyancy of the stock market has bred a confidence in the future that has led some merchants to forestall their requirements. And during the week ended last Saturday there was some evidence of the anticipatory buying that usually engenders what is called a boon in American business parlance.

This was the case in the dry-goods market where demand for cotton, wool and silk fabrics is still active. And from Chicago it is reported that the annual preinventory sale of Marshall Field & Co., and the opening of Carson, Pirie, Scott & Co. in the John V. Farwell Building on last Monday attracted the largest crowds of buyers in the history of these two institutions.

There has also been an advance in wheat which is explained as interseasonal, but, nevertheless, may be the result of abundant credit.

The sugar market is another example of the same tendency. Prices have advanced nearly 20 points despite the bearishness of the trade who seem unable to see the forest for the trees.

What's Doing in Industry

With two months of this year left, machine tool and machinery sales show every indication of continuing the present volume of sales. October proved to be one of the best months of the year, with the automotive industry doing the bulk of the buying.

Reports from the important industrial centers give a most encouraging picture of the progress of machinery sales. In Detroit the automobile manufacturers are buying much special equipment in preparation for the expansions that are to come after the first of the year. Cincinnati dealers report an upward trend in sales, with railroads again active as buyers. Sales and new inquiries in Chicago have exceeded expectations, many small manufacturers coming into the market for tools.

Increased activity in mining and construction projects has brought more business to Indianapolis dealers, with prospects for continued betterment as the colder weather sets in. In the East, sales in Buffalo and New York show a better tone, with orders coming from unexpected sources. In the former city many dealers report better business than at any time this year. Canada reports a better sentiment in the metal trades, with large industrialists making urgent inquiries for machine tool equipment.

The latest figures of the Department of Commerce show that exports of metal-working machinery in September were almost a half million more in value than they were last year. Lathes, gear cutters and milling machines showed the greatest gains.

Only slight changes are reported in the prices of steel, iron, copper and the other leading metals, but the optimism expressed by Judge Gary and Charles Schwab is pervasive, and confidence in the future appears to be increasing.

In the field of international finance there have been some interesting developments. Caillaux and the Ministry of which he was a member have been compelled to resign. And the financial future of France seems to depend upon whether their successors will be willing and able to induce the French people to submit to a capital levy, and pay the taxes that must be imposed if the nation is to meet its financial obligations.

Otherwise the value of the franc will evaporate and the history of the assignats and the mandats, issued during the French Revolution, will be repeated. Meantime the franc, which declined to 4.06¾ early in the week has been a little steadier on purchases supposed to have been made by using the credit arranged with J. P. Morgan & Co. But the restoration of French confidence in the obligations of the French nation is the only permanent remedy for present conditions.

There is some confusion as to the exact amount of gold recently imported from England, but it is generally estimated at about $40,000,000. Of this sum we appear to have exported $15,000,000 to Canada, so that our net gain is about $25,000,000. This accounts for the improvement in the position of Federal Reserve Banks, as shown by the weekly statement issued last Thursday. Total gold reserves gained approximately $4,000,000 more during the past week, bringing the total net increase in two weeks up to $16,000,000. The combined reserve ratio is practically unchanged at 72.5 per cent.

If, as some believe, Great Britain intends to continue sending us most of the gold produced in South Africa, we may have real inflation and a sustained advance in prices here. But this expectation seems rather imaginative, and, if business in this country keeps its present pace, or quickens it, our supply of bank credit may be used up with astonishing rapidity.

It is this possibility that makes thoughtful men cautious as they face a situation whose complexity is greatly increased by the fact that international as well as national influences play such an important part in determining conditions here. For this reason, it is not too much to say that the trend of business in the United States will be largely dependent upon whether we collect what is due us from abroad in merchandise or in gold. In the former case the threatened inflation will be quickly ended. But if we are to continue to import gold it will persist.

The Industrial Review

Progress of the machinery and machine-tool business in various parts of the country

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

Cincinnati

An upward trend in the market during the past week is reported by Cincinnati machine tool manufacturers. The majority report that orders and inquiries are evenly distributed over the various industrial sections of the country. It was also stated that the demand was well equalized in regard to sizes and types of tools.

The majority of manufacturers report a good demand in the past week from the automotive industries, but some state that with them it diminished to some extent. A great many inquiries are coming from this field, however, and this is commonly regarded as an indication of increased buying.

Railroads have done some buying, principally of replacements. Some export demand is reported, this being for special tools. General machinists and industrial concerns ordered more than in the previous week, and they sent in an increased number of inquiries.

Selling agencies report an increased number of orders in the past week, most of which were for replacements. The increased number and size of inquiries received by them leads this branch of the trade to look for continued improvement.

Chicago

The month of October has justified the predictions of forward looking dealers in machine tools with respect to the volume of business it would show. Inquiries and sales covering every description of new and used equipment are reported to have surpassed expectations, but the most satisfactory aspect of the market situation is found in the fact that the business transacted has spread over a wider area, and has included smaller industrial plants in an increasing number.

The last few days have brought inquiries from sources that indicate a continuation of the upward course of the market, at least for the month of November, and a general tone of optimism prevails in machinery circles. Johns-Manville, Inc., is inquiring for a number of tools, including drill presses, shapers, grinders, lathes and saws. The National Paper Container Co., of Milwaukee, is in the market for lathes of various dimensions. Recent bids for equipment are reported to have been closed by the Nash Motors Co., of Kenosha, Wis., the Studebaker Corporation, of South Bend, Ind., and the A. O. Smith Co. of Milwaukee.

Buffalo

October will probably show up as the best month of the year for Buffalo machine tool dealers. This does not mean that every dealer is reporting better business. Some of them are up and some are down but mostly up. One dealer reported that October would be "by far" the best month of the year. Several reported that it would be the best month in five or six months.

One of the most encouraging phases of the present condition is the fact that many old customers are reported to be making inquiries and are evidently getting ready to buy. The report was made of one case of a manufacturer who had bought practically nothing since 1918 who is now making inquiries. Another dealer reported a customer making inquiries who had not been in the market for five years.

Some dealers believe, however, that there will be no great buying until after January first. There is a tendency even now to request price proposals for probable purchases "after the first of the year."

The demand for electrical equipment is good and, like that for machine tools, is spread over such a wide variety of industries that it is impossible to say that one is better than another.

Railroad buying is comparatively unimportant in the Buffalo market. The early closing in of winter has had the effect of closing up a lot of contract work in that branch of the business. Practically all dealers report that Buffalo industries are preparing for big business during the next few months.

Indianapolis

The coming of cold weather has helped the machine tool trade materially. In the first place the railroads are increasing their purchases and inquiries from this source are becoming more active than for months. Several railroad shops in this state, which have been working "under wraps" for six months, are increasing the number of employees and the number of hours a week. The general sales trend is upward.

One of the most encouraging features of the local trade is the increased activity on the part of the automotive industry here. Two factories are working steadily. Their buying is only what is absolutely necessary, but it is much more active than it has been. The demand for specialized machinery for body plants also is increasing, which is considered a good omen for the coming winter's business.

Machinery men say the demand for western Indiana coal mines for coal mining machinery is picking up rapidly. Most of these mines have worked steadily since the beginning of the anthracite strike and now have some surplus with which to make some long needed improvements. Machinery demand from lumber, milling and furniture plants continues fair. Dealers in used machinery report a decided increase in their business.

New York

Sales of machine tools and industrial machinery have reached a satisfactory level in this market. The last week of October, and the first few days of November saw a decided change in the attitude of buyers. While long delays have characterized most buying in the past few months, recent orders have come quickly after receipt of quotations. This is an encouraging trend as it proves the urgent need for tools and equipment.

Practically all types of machines are in demand—presses, milling machines, centerless grinders, drills and lathes. Also, there is a distinct demand for yard equipment in the form of heavy-duty cranes and trucking equipment.

Few new inquiries have been received from railroads, and recent purchases have been confined to single machines. The B. M. T. rapid transit line, however, placed orders for a half dozen machines of various types. These were bought on an old inquiry.

The Florida East Coast R.R. bought a 90-in. heavy-duty lathe and a 96-in., 600-ton wheel press. D. F. Perkins & Co. bought a 36-in. x 33-ft. lathe, and the Champion Paper Co. placed an order for eight 150-hp. Maag reduction units. Other orders called for an 84-in. vertical boring and turning mill, two 15-ton cranes, six automatic lathes for the Delco Light Co., and an automatic centering machine and two automatic lathes for the Chrysler plant.

Canada

There has been a better sentiment in the metal markets of Canada during the last two weeks. This increased optimism and activity hinges largely upon rail business and upon the fall buying movement. The principal steel mills have been able to increase their schedules by reason of rail orders from both the Canadian National and Canadian Pacific railways. The bar and small product mills are also reporting increases in orders. A gradual improvement is taking place in warehouse demand.

With the tremendous industrial development at present under way in the Saguenay district, there is a good demand for pulp and paper and electrical machinery and equipment. The Canadian Westinghouse Co., Ltd. recently received a contract for the electrical equipment to be installed in the pulp and paper mill being constructed by the Port Alfred Pulp and Paper Corporation at Peribonca. This mill is being built at a cost of $3,500,000. It has also been announced that ten of the largest turbines in the world, with a capacity of 80,000 hp. each, are to be installed at Chipsaw, Quebec, where the new Aluminum Corporation plants are under construction.

The output of pig iron continues to increase. Sharp declines were noted in the foundry and malleable trades, but this loss was more than offset by the increased tonnage of basic iron made for the further use of the producing firms.

Detroit

With but two months left in 1925, dealers in machinery and machine tools in Detroit have just cause for declaring the present year one of the best ever experienced in this market and in forecasting extensive orders during the remaining weeks before January first. For the past five months sales have been far ahead of last year's, and even the present finds many representatives of machinery manufacturers far behind in deliveries.

While automobile production is likely to fall off to some extent during November and December, because of annual inventories, the first of the year will witness most of the manufacturers swinging into record production once again.

Engineering staffs are concentrating on machinery which will enable their plants to maintain peak outputs beginning with automobile show time. Several orders for heavy machines to be delivered in January and February have been placed, while lists for smaller tools are out at present.

Considerable cylinder finishing machinery is being ordered by a number of plants. Dodge Brothers are purchasing gear equipment, forge hammers and furnaces. There has been quite a market for lathes, radial drills, screw machines and upright drills. More than half the present machine tool market is for special equipment.

Employment figures are still breaking records, something like 266,253 being employed in the automobile and accessory plants of Detroit at present.

S. A. E. to Hold Meetings at Chicago and Philadelphia

Diagnosis of car and engine troubles and the choice of suitable methods for remedying them will be among the topics discussed at a national service engineering meeting of the Society of Automotive Engineers, to be held in Chicago on Nov. 9 and 10, at the Hotel LaSalle, in co-operation with the National Automobile Chamber of Commerce. The following day has been set aside as "S. A. E. and Service Men's Day" at the exposition of automotive equipment that is to be staged by the Automotive Equipment Association in the Coliseum during the week.

Two service sessions of the two-day meeting are to be under the direction of the National Automobile Chamber of Commerce and two under the direction of the Society of Automotive Engineers.

Speakers at Two Sessions

Among the addresses to be delivered are two on corrosion in internal combustion engines, by Frank Jardine, of the Aluminum Co. of America, and M. A. Thorne, of the Tidewater Oil Co.; two on car and engine troubles and the remedies for them, by C. L. Sheppy, Walter Pleuthner and J. C. Talbot, of the Pierce-Arrow Motor Car Co., and Carl Breer and John Squires, of the Maxwell-Chrysler Motor Corporation; one on car maintenance, by J. F. Lord, of the Durant Motor Car Co.; one on fuel from the service standpoint, by T. A. Boyd, of the General Motors Corporation; and one on new devices for improving car operation, by Donald Blanchard, of the Chilton-Class Journal Co.

Service engineers and managers who are not members of the S. A. E. will be welcome at the technical sessions.

Motor Transportation at Philadelphia Session

Motorcoach operation, the standardization and regulation of motorcoaches, and the handling of freight and store-door deliveries by motor truck are to be the principal topics discussed at a national automotive transportation meeting of the Society of Automotive Engineers, to be held in Philadelphia on Nov. 13 and 14, at the Benjamin Franklin Hotel.

The handling of freight by motor trucks in co-operation with the railroads and the closely associated subject of direct deliveries of freight from railroad terminals to consignees' doors are to be dealt with in papers by Joseph Scott, of Scott Bros., Philadelphia, F. H. Kulp, of the Kulp Transportation Lines, Buffalo; and a representative of a Canadian organization.

Dr. E. J. Cattell, of Philadelphia, is to be the principal speaker at the banquet, at which A. F. Masury, of the International Motor Co., will act as toastmaster. B. B. Bachman, of the Autocar Co., F. C. Horner, of the General Motors Corporation, and A. J. Scaife, of the White Motor Co., are to be chairmen respectively of the sessions on standardization, freight handling, and motorcoach operation.

Personals

P. E. Seibel has joined the sales staff of the Triplex Machine Tool Co., of 50 Church St., New York.

Owen D. Young has been appointed chairman of the American Committee of the International Chamber of Commerce, succeeding the late A. C. Bedford.

Lewis Hilton has been transferred from the Denver to the Philadelphia office of the Chapman Valve Manufacturing Co.

Roy Baer has been transferred from Schenectady to the engineering department of the General Electric Co., at Osaka, Japan.

Eugene A. Johnson has been appointed assistant to the superintendent of the Pratt & Whitney Co., Hartford, Conn.

Raymond G. Bullock has been appointed works manager of the Art Metal Construction Co., at Jamestown, N. Y.

E. J. Frost, president of the National Machinery Co., has gone to Europe on a business trip.

F. M. Cross, formerly manager of the pneumatic tool department in the New York office of the Ingersoll-Rand Co., has been appointed manager of the same department in the Chicago territory, with headquarters in Chicago.

Ralph E. Flanders, of the Jones & Lamson Machine Co., of Springfield, Vt., will deliver a lecture on Nov. 19 before the New Britain Section of the American Society of Mechanical Engineers.

Herbert C. M. Stevens, formerly chief engineer of the Sunbeam Motor Co., of Wolverhampton, England, has been appointed consulting engineer for the Olds Motor Works, of Lansing, Mich.

John McGeorge has been appointed works engineer of the Oakland Motor Car Co., of Pontiac, Mich. He had been connected with the Oakland engineering department for several years.

Delmar G. Roos, vice-president and chief engineer of the Locomobile Co., at Bridgeport, Conn. has resigned.

P. J. Riccobene has joined the home office sales organization of the Uehling Instrument Co., 473 Getty Ave., Paterson, N. J.

John J. Foote, general sales manager of the McClary Manufacturing Co., London, Ontario, has been transferred to Toronto as manager of the firm's Toronto branch. M. F. Irwin, who has been manager at Toronto is moving back to London and will be in charge of sales.

H. S. Pritchard, general sales manager of the Ford Motor Co. of Canada, has resigned.

J. W. Gibson, general manager of the Canada Cycle and Motor Co., has been elected a director of the Russell Motor Car Co.

A. B. Ames of Montreal, Canada, has been elected vice-president of the Russell Motor Car Co., succeeding T. A. Russell who was recently appointed president.

C. F. Page, general manager of the Great Western Railways of England, is now in Canada on an educational tour. Mr. Page is touring the Western provinces, following which he proposes to make a study of railways of the United States.

R. S. McLaughlin, K. T. Keller and W. H. Moyse, president, general manager and chief engineer, respectively, of the General Motors of Canada, Ltd. have sailed for Europe to make a study of export conditions and attend the annual Olympia Motor Show.

William Althoff, assistant chief of the industrial machinery division of the Department of Commerce, is making a short trip to Birmingham, Ala., and Atlanta, Ga., for the purpose of consulting with machinery manufacturers and exporters. Interested parties wishing to confer with Mr. Althoff can make the necessary arrangements through the foreign trade secretary of the Chamber of Commerce at Birmingham, or through the south Atlantic district office of the Bureau of Foreign and Domestic Commerce, at Atlanta.

C. F. McCampbell, of Indianapolis, has been elected general manager of the New Process Iron and Steel Co., with a factory at Noblesville Ind. He replaces James Hundley. At the annual meeting of the board of directors, J. F. Reinier was re-elected president; J. E. Owen and E. E. Worth vice-presidents.

J. R. Vandyck to Lead Machine Tool Dealers

An informal discussion of business conditions as affecting machine tool dealers, and the election of officers for the coming year, were the principal features of the two day meeting of the Associated Machine Tool Dealers, held at Cambridge Springs, Pa., Oct. 26 and 27.

There was no formal presentation of papers, all the speakers being selected by the chair and the subjects being concerned mostly with business conditions and the relative position of the dealer in the present economic structure.

James R. Vandyck, of the Vandyck-Churchill Co., New York, was elected president of the association. Charles P. Bush, of Charles A. Strelinger & Co., Detroit, was elected vice-president. The secretary is Tyler W. Carlysle, of the Strong, Carlysle & Hammond Co., Cleveland, and the treasurer is George H. Cherrington, of the Brown & Zortman Machinery Co., Pittsburgh.

Obituaries

Charles Potter, of the Potter & Johnston Machine Co., of Pawtucket, R. I., died at Bournemouth, England, on Oct. 30, following an operation.

George A. Post, president of the George A. Post Co., manufacturer of railway supplies, died at his home in Somerville, N. J., on Oct. 31. Mr. Post was chairman of the railroad committee of the United States Chamber of Commerce, and at one time was president of the Machinery Club and also of the Railroad Club. He was for several years associated with the mechanical departments of various railroads, and was also interested in newspaper work, being editor of more than one daily newspaper, including the New York *World*.

Thomas A. Coleman, president of the Madison Kipp Co., of Madison, Wis., died on Oct. 19. He was 67 years old. Mr. Coleman was a vice-president of the International Harvester Co.

George M. Basford, prominent railway mechanical engineer and well-known in machinery circles, died on Oct. 26. Mr. Basford was taken suddenly ill while waiting for a train to go to his home in Mt. Vernon, N. Y.

He was graduated from the Massachusetts Institute of Technology in 1889 and later worked in the Charleston shops of the Boston & Maine R.R. and then went to the Chicago, Burlington & Quincy as a draftsman. After working in the motor power and test departments of the Union Pacific he went to the Chicago, Milwaukee & St. Paul as a signal engineer. Later he was superintendent of construction for the Johnson Railway Signal Co., was with the Union Switch and Signal Co. for a short time and then was signal engineer of the Hall Signal Co. In 1895 he became mechanical editor of *The Railway and Engineering Review* and two years later editor of *The American Engineer and Railroad Journal*. He was made assistant to the president of the American Locomotive Co. and in 1913 became chief engineer of the railroad department of Joseph T. Ryerson & Son. Mr. Basford organized the G. M. Basford Company to handle technical railway advertising in 1913 and was head of this firm when he died. He was a charter member of the Railway Signal Association, the American Society of Mechanical Engineers, the New York Railroad Club and various organizations of railroad men.

Albion B. Peavey, vice-president and sales manager of the G. F. Wright Steel and Wire Co., of Worcester, Mass., and a resident of Worcester, died on Oct. 22 at the Memorial Hospital in that city. Mr. Peavey, who was 64 years of age was born in Lubec, Me. He was one of the early incorporators of the G. F. Wright Steel and Wire Co.

Business Items

The United States Electrical Tool Co., of Cincinnati, announces that it has made arrangements with the Westinghouse Electric and Manufacturing Co., whereby its line of portable tools will be handled through the twenty-eight Westinghouse service stations in the United States.

The Brown Instrument Co. of Philadelphia, announces the establishment of two new branch offices. One in Indianapolis will be located at 215 E. New York St., in charge of J. R. Green; the other in Cleveland, at Room 1108 Hippodrome Bldg., in charge of G. S. Frazee.

The Warwood Tool Co. has acquired a plant for the manufacture of piston rings at Eleventh St. and Philadelphia Road, Baltimore, Md. H. H. Kistner has been appointed general manager.

The Corbett Machine and Gear Co., Ltd., is the name given to the reorganized Corbett Foundry and Machinery Co., of Oshawa, Canada. The new company will engage in the cutting of gears on a recently perfected machine that is said to cut all teeth at one time, instead of the usual practice of cutting one at a time.

The Miles Machinery Co. of Saginaw, Mich., has moved into new and larger quarters which have been remodelled to suit the business expansion of the company. The new plant includes testing laboratories, a machine shop for rebuilding equipment and extensive storage space. The new building is located at 900 S. Niagara St., Saginaw.

The Uehling Instrument Co., of Paterson, N. J., recently appointed the Ernest E. Lee Co., 115 South Dearborn St., Chicago, to represent it in northern Illinois and northern Indiana in connection with the sale of recorders, fuel waste meters and other power plant instruments. The Coon De Visser Co., which has been representing the Uehling Instrument Co. for several years in Michigan, has just moved from 1772 to 2051 W. Lafayette Blvd., in Detroit.

The MacRae's Blue Book Co., of Chicago, having acquired control of Hendricks Commercial Register, will, upon its next edition, issue a general directory, known as "MacRae's Blue Book, consolidated with Hendricks Commercial Register." The consolidated publication will cover not only the steam and electric railroad field, but also the worth-while industries of America, public utilities, chambers of commerce, etc. On the new advisory board appear the names of Dr. Howard M. Raymond, president, Armour Institute of Technology; Burley B. Ayers, the American Steel and Wire Co.; George Hull Porter, the Western Electric Co.; Carl Hamilton, the Weyerhauser Forest Products; F. E. Paradis, N. Y. C. Lines; C. W. Kelly, secretary, National Railway Appliances Association; Ernest F. DuBrul, general manager, National Machine Tool Builder's Association.

Trade Catalogs

Stellite. Haynes Stellite Co., Carbide and Carbon Bldg., 30 East 42nd St., New York, N. Y. An 8½x11-in. booklet of 15 pages has been prepared entitled "Properties of Haynes Stellite." Reports are given on hardness and breaking tests, resistance to abrasion, compressive and tensile strength, coefficient of friction, electric and thermal conductivity, magnetic properties, density, melting point and coefficient of thermal expansion. Its resistance to corrosion by acids and miscellaneous reagents is shown in two tables.

At the end of the book are illustrated a few applications of Haynes Stellite.

Taps. John Bath & Co., Inc., 8 Grafton St., Worcester, Mass., have published Catalog No. 10, the "Ground Thread Book." Within its sixty-six, 5½x8-in. pages, is a general catalog of Bath products, a 10-page section on the relation of Bath ground threads to industry and twenty-eight pages of information and thread tables. This section includes definitions of threading terms, a discussion of pitch diameter and its measurement, and tapping helps. There are eight tables including tolerances, tap dimensions, gage dimensions and decimal equivalents for an inch.

Circuit Breakers. Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa. Circular 1705-A is a bulletin of twenty-four 8½ x 11½-in. pages covering the type CL carbon circuit breakers for industrial application. The applications and functioning of the breaker are well described with the aid of many photographs and diagrams. The directions for operating the different models are complete and well arranged.

Speed Reducers. Philadelphia Gear Works, Richmond and Tioga Sts., Philadelphia, Pa. A four-page circular has been published to illustrate the various types of gear reducers made by this company. Views of several installations are shown.

Electric Light Fixtures. The O. C. White Co., 15-21 Hermon St., Worcester, Mass. Catalog No. 26 lists and illustrates the various types of adjustable electric light fixtures. These include desk fixtures, telescopic floor portables and fixtures for use in the shop.

Electric Motors. The Reliance Electric & Engineering Co., Ivanhoe Road, Cleveland, Ohio, has published Bulletin No. 4000 to cover its line of ball and roller bearing motors. It includes descriptions and illustrations of vertical and horizontal squirrel-cage motors and special dust-tight models.

Flow Meters. General Electric Co., Schenectady, N. Y. Bulletin No. GEA-10 describes the G-E mechanically operated indicating and recording types of flow meters. The principles of operation and the mechanisms of the instrument as well as the various parts are detailed.

Photographs and diagrams are used to illustrate the principal types and methods of operation.

Tables at the end of the catalog show the dimensions of the nozzles, pitot tubes and pipe fittings.

Motion and Operation Recorders. The Bristol Co., Waterbury, Conn., has published Catalog No. 1600 dealing with the mechanical motion and electrical operation recorders manufactured by this company. The purposes of the instruments are shown as well as full-size reproductions of typical charts given. Several methods of applying the recorders are shown by diagrams. Parts and accessories are given individual attention.

Carbon Dioxide Recorders. Uehling Instrument Co., 473 Getty Ave., Paterson, N. J. Bulletin 118 is devoted to the Apex CO_2 recorders and indicators. The operation and applications are briefly described in this circular.

Pamphlets Received

Methods of Compensating Office Employees. Published by the Metropolitan Life Insurance Co., Madison Ave., New York, N. Y. Methods of Compensation, Series No. 4. This pamphlet deals with the methods for determining a reasonable wage incentive for office employees. Several systems are mentioned as are the pitfalls in developing wage scales.

How to Cut Crucible Costs. Published by The Plumbago Crucible Manufacturers' Publicity Bureau, 90 West St., New York, N. Y. This 12-page pamphlet contains suggestions pooled from the information of the principal plumbago crucible manufacturers of the country. The information covers the storing, handling and use of plumbago-crucibles. Some of the paragraph topics are storage, dampness, preheating, annealing, charging and pouring. Tables at the end of the pamphlet give the melting points of various metals, brass alloy composition, tensile strength of aluminum alloys and standard crucible sizes.

Alloy Steels. Published by The Central Steel Co., Massillon, Ohio. A celluloid disk is being distributed which gives the composition of 21 specified steels as well as the heat-treatment of each. Tables on one face of the disk give heat and draw temperatures and colors and Brinell hardness data.

A 1925 Review of the Department of the Interior. By Hubert Work, Secretary. Published by the Department of the Interior. The 1925 review is 42 pages in length and describes the organization and activities of the department as well as its relation to other government work. The various projects on which the department is engaged and the work which it has accomplished are described and illustrated by several photographs.

Calendar of Local Meetings

National Association of Cost Accountants

New York Chapter. Nov. 10. "The Elements of Standard Costs," by G. Charter Harrison.

Albany Chapter. Nov. 11. Description of manufacturing methods and discussion of general accounting scheme and accounting methods.

Worcester Chapter. Nov. 12. "Mechanical Appliances—Their Uses and Costs."

Philadelphia Chapter. Nov. 13. "Relation of Sales Quotas and Credits to Production and Costs," by J. W. Hallman.

Mohawk Valley Chapter. Nov. 16. "Materials Budget, or Costing the Materials."

American Society of Mechanical Engineers

Metropolitan. Nov. 12. Engineering Societies Building. Subject: "Subterranean Heat as a Source of Energy." Speakers: L. P. Breckenridge, George Otis Smith and J. D. Galloway.

Los Angeles Chapter. Nov. 17. "Recording the Unrecorded Cost," by E. C. D. Price and H. H. Baskerville.

Cleveland Chapter. Nov. 18. "Business Forecasts and Labor Control and Distribution."

Pittsburgh Chapter. Nov. 18. "Cost and Budget Systems for Public Education," by Dr. Frank Haas.

Rochester Chapter. Nov. 18. "The Elimination of Clerical Work by Simplified Cost Finding," by C. H. Scovell.

Syracuse Chapter. Nov. 18. "Questions the Executive Expects the Cost and Accounting Department to Answer," by F. L. Sweetster.

Boston Chapter. Nov. 19. "Reducing Inventory Investment Through Turnover," by Clifford B. Wright.

Buffalo Chapter. Nov. 19. "The Cost of Collections."

Chicago Chapter. Nov. 19. "Planning for Future Financial Position," by F. M. Kasch.

San Francisco Chapter. Nov. 23. "Cost Accounting in the Printing Trades."

Detroit Chapter. Nov. 28. "Methods of Taking Inventories."

Forthcoming Meetings

American Institute of Steel Construction. Annual convention, White Sulphur Springs, W. Va., Nov. 11 to 14. C. F. Abbott, executive secretary, 350 Madison Ave., New York City.

National Founders' Association. Annual Convention, Hotel Astor, New York, Nov. 18 and 19. J. M. Taylor, executive secretary, 29 So. La Salle St., Chicago.

American Society of Mechanical Engineers. Annual meeting, Engineering Societies Bldg., 29 West 39th St., New York City, Nov. 30, to Dec. 4. Calvin Rice, secretary, Engineering Societies Bldg., New York.

National Exposition of Power and Mechanical Engineering. Fourth annual event, Grand Central Palace, New York City, Nov. 30 to Dec. 5. Charles F. Roth, manager, International Exposition Co., Grand Central Palace, New York City.

American Association for the Advancement of Science. Annual meeting, Kansas City, Mo., Dec. 28, 1925, to Jan. 2, 1926. Barton E. Livingston, secretary, Smithsonian Institute Bldg., Washington, D. C.

American Society for Steel Treating. Winter sectional meeting, Hotel Statler, Buffalo, N. Y., Jan. 21 and 22. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—With spot coke at $9 to $10 per ton, Connellsville (a rise of $1 within the week) reports from Birmingham show an advance of $1 to $2 per ton on No. 2 foundry pig iron. Anthracite shortage started the domestic demand for coke; demand for spot coke affected pig iron, therefore higher steel prices may be the eventual outcome of this sequence. In the current market there is particular firmness in bars, tin plates, black and galvanized sheets, and strip steel. Quotations on the principal hot-rolled products are: bars, $2; shapes, $1.90@$2; plates, $1.60@$1.90 per 100 lb., Pittsburgh mill.

Non-Ferrous Materials—Prices of non-ferrous metals continue to climb. Copper is ¼c.; lead, ¼c.; zinc, ⅝c.; aluminum, 1c.; and antimony, 1¼c. per lb. above the Oct. 23 level at New York warehouses. Linseed oil is down 0.5c. per lb.

(All prices as of Oct. 30)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$23.05
Northern Basic	22.27
Southern Ohio No. 2	22.77
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	27.37
BIRMINGHAM	
No. 2 Foundry	21@22
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	22.26
Virginia No. 2	29.17
Basic	21.16
Grey Forge	....
CHICAGO	
No. 2 Foundry local	22.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	25.55
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.77
Basic	20.77
Bessemer	20.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	5.00@5.50
Cleveland	4.90@5.00
Cincinnati	5.00@7.50
New York	5.00@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	New York	Cleveland	Chicago
No. 10	2.30@2.40	3.89	3.00	3.50
No. 12	2.35@2.45	3.94	3.05	3.55
No. 14	2.40@2.50	3.99	3.10	3.60
No. 16	2.50@2.60	4.09	3.20	3.70
Black				
Nos. 17 to 21	2.95@3.05	4.15	3.60	3.80
Nos. 22 to 24	3.00@3.10	4.20	3.65	3.85
Nos. 25 and 26	3.05@3.15	4.25	3.70	3.90
No. 28	3.15@3.25	4.35	3.80	4.00
Galvanized				
Nos. 10 and 11	3.30@3.40	4.35	4.00	4.00
Nos. 12 to 14	3.40@3.50	4.45	4.10	4.10
No. 16	3.55@3.65	4.60	4.25	....
Nos. 17 to 21	3.70@3.80	4.75	4.40	4.40
Nos. 22 to 24	3.85@3.95	4.90	4.55	4.55
No. 26	4.00@4.10	5.05	4.70	4.70
No. 28	4.30@4.40	5.35	5.00	5.00

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	54%	41%
3½ to 6 in. steel lap welded	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameters Inches External	Diameters Inches Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ¼-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
¼	$0.15	50%	⅞	$0.18	35%
⅜	.16	45%	1	.19	31%
½	.17	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.30 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	....	4@4.65
Spring steel (light) (base)	6@7	6.00	6.00
Coppered Bessemer rods (base)	6.05	....	....
Hoop steel	4.49	3.85	4.15
Cold rolled strip steel	6.35	8.25	6.80
Floor plates	5.55	5.60	5.50
Cold drawn shafting or screw	4.15	3.80	3.60
Cold drawn flats, squares	4.65	4.30	4.10
Structural shapes (base)	3.34	3.20	3.10
Soft steel bars (base)	3.24	3.10	3.00
Soft steel bar shapes (base)	3.24	3.11	3.10
Soft steel bands (base)	3.99	3.20	3.65
Tank plates (base)	3.34	3.40	3.10
Bar iron (3.00 at mill)	3.24	3.21	3.00
Drill rod (from list)	60%	55%	60%

Electric welding wire, New York, 3/32, 8.25c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			15.37½
Tin, 5-ton lots, New York			66.00
Lead (up to carlots) E. St. Louis	9.25	New York	10.50
Zinc (up to carlots) E. St. Louis	8.70	New York	9.87½

	New York	Cleveland	Chicago
Antimony (Chinese), ton spot	21.00	20.25	....
Copper sheets, base	22.75	22.75	22.75
Copper wire, base	20.25	17.00	16.75@17
Copper bars, base	21.87½	21.50	21.87½
Copper tubing, base	24.75	25.50	24.75
Brass sheets, base	19.12½	19.00	19.12½
Brass tubing, base	23.75	23.75	23.75
Brass rods, base	16.87½	16.87½	16.87½
Brass wire, base	19.62½	22.50	19.62

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1–15 ton lots	28@29	28.00	28.03
Zinc sheets (casks)	11.25	12.00	11.87
Solder (½ and ½), (case lots)	39.50	41.00	38@42
Babbitt metal (83% tin)	60.00	72 50	58@63
Babbitt metal (35% tin)	28.00	22.50	30@35
Nickel (ingots) f.o.b. refinery	31.00	.....	.....
Nickel (electrolytic) f.o.b. refinery	38.00	.....	.....
Nickel (shot) f.o.b. refinery	32.00	.....	.....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Hot rolled nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00
Manganese nickel hot rolled rods "E"—low manganese (base)	54.00
Manganese nickel hot rolled rods "D"—high manganese (base)	57.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00
Cold rolled sheets (base)			50 00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible heavy copper	12.25@12.50	11.50	11.75@12.25
Copper, heavy, and wire	11.50@12.00	11.25	11.25@11.75
Copper, light, and bottoms	9.75@10.25	9.50	10.25@10.75
Heavy lead	8.00@8.37½	7.50	7.75@8.25
Tea lead	6.75@7.25	4.50	6.75@7.25
Brass, heavy, yellow	7.25@7.50	7.00	7.50@8.00
Brass, heavy, red	9.75@10.12½	....	9.00@9.50
Brass, light	6.25@6.50	6.00	7.75@8.00
No. 1 yellow rod turnings	8.50@9.00	9.25	7.50@8.00
Zinc	5.00@5.50	4.25	5.00@5.50

TIN PLATES—American Charcoal—Bright—Per box

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$11.25	$11.45	$11.50
"A" Grade:				
IC,	14x20	8.85	9.40	9 50
	Coke Plates—Primes.			
100-lb.,	14x20	6.50	6.10	7.00
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	7.25	6.95	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.15@0.22	$0.19	$0.20
Cotton waste, colored, per lb.	.10@.15½	.18	.17
Wiping cloths, washed white, per lb	.17½	36.00 per M	.15½
Sal soda, per 100 lb. keg	2.25	2.25	2.75*
Roll sulphur, per 100 lb. keg	3.75	3.75	4.50
Linseed oil, per gal., 5 bbl. lots	1.00½	1.15	1.01
Lard cutting oil, 25% lard, per gal.	.55	.50	.72
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.35	.35	.26
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft. per inch of width for single ply.			
Medium grade	40%	40%	30–10%
Heavy grade	30–10%	35%	30–5%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%
Second grade	50–10%	60–5%	50–10%

*In 175 lb. kegs.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.0415	.0415	.0405
Brass rods	per lb	.1687½	.1687½	.1487½
Solder (½ and ½)	per lb.	.395	.395	.38@.39
Cotton waste	per lb.	.15@.22	.15@.22	14@21
Washers, cast iron (½ in.)	per 100 lb.	7.00	7.00	6.50
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.55	3.55	3.38
Lard cutting oil	per gal.	.55	.55	.55
Machine oil	per gal.	.35	.35	.29
Belting, leather, medium	off list	40%	40%	40–2½%
Machine bolts up to 1x30 in.	off list	40%	40%	45%

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.46	$5.84	$5.00
Emery paper	10.71	11.00	11.90
Emery cloth	29 48	31.12	32.75
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.41	1.40
Cloth	3.55	2.67	3 55
Fire clay, per 100 lb. bag		.60	.75
Coke, prompt furnace, Connellsville	per net ton	9.00@10.00	
Coke, prompt foundry, Connellsville	per net ton	9.00@10.00	
White lead, dry or in oil	100 lb. kegs	New York, 15.75	
Red lead, dry	100 lb. kegs	New York, 15.75	
Red lead, in oil	100 lb. kegs	New York, 17.25	

SHOP SUPPLIES

Machine bolts, ¼x1½-in., per 100, $1.70. Discount at New York warehouses on all sizes up to 1x30-in., 40%; 1¼ and 1¼x3-in. up to 12-in., 15%; with cold punched hex. nuts up to 1-in. dia. (plus std. extra of 10%) 30%; with hot pressed hex. nuts up to 1x30-in. (plus std. extra of 10%) 35%.

Carriage bolts, ¼x1½-in., per 100, $1.00. Discount on all sizes up to 1x30-in., 30%.

Coach and lag screws, 1½x$\frac{5}{16}$in., $2.25 per 100, less 40%.

Tap bolts, 1½x¼-in., $1.00 per 100. List plus 35% at New York warehouses.

Bolt ends, 1x12-in., 10c. per lb., less 40%.

Nuts, semi-finished, ¼x¼-in., 2c. each. Discount 70% for $\frac{5}{16}$-in and smaller and 65% for ⅜-in. and larger.
Case hardened ¼x¼-in., 6c. each, less 50%.

Rivets, button heads, ⅜-in., ½-in., 1-in. diam. x2$\frac{1}{16}$-in. to 4½-in., $5.00* per 100 lb. at New York warehouses; cone heads, same sizes, $5.20* per 100 lb. Rivets, $\frac{7}{8}$x1-in. and longer, 19c. per lb., less 50%. Same discount for tinned. EXTRA per 100 lb. for 1¼ to 2-in. long, all diameters, 25c.; ⅜-in. dia., 35c.; ½-in. dia., 75c.; 1-in. long and shorter, 75c.; longer than 5-in., 50c.; less than 200 lb., 50c.; countersunk heads, 45c.

Washers, cast iron, ½-in., $7.00* per 100 lb. at New York warehouses; ⅜-in., $6.00* per 100 lb.

*For immediate delivery from warehouse.

Machine Requirements and Industrial Construction

Machine Tools and Equipment Wanted

Ala., Albany—Decature Iron & Steel Co. 48 in. gate shear ¾ in. capacity.

Md., Baltimore—Carr Lowrey Glass Co., Westport—air compressor, 50 lb. pressure capacity 1,000 to 1,200 cu.ft.

N. Y., Buffalo—W. Teere, 1089 Genesee St.—equipment for proposed welding shop.

N. Y., Syracuse—Syracuse Supply Co., 314 West Fayette St.—12 ft. boring mill (new or used).

Pa., Blairsville—Conemaugh Iron Works 4 ton overhead electric crane for foundry.

Pa., Economy—Standard Seamless Tube Co.—20 ton overhead electric crane.

Pa., Johnstown—Bethlehem Steel Co.—2 frog and switch planers for Cambra works.

Pa., Johnstown—Lorain Steel Co.—3 frog and switch planers.

Pa., Pittsburgh—Carnegie Steel Co., Carnegie Bldg., C. A. Miller, Purch. Agt.—six 3 magnet beam handling cranes for Homestead plant.

Pa., Pittsburgh—Superior Steel Corp., Union Trust Bldg.—25 ton 45 ft. span overhead electric crane.

Vt., Proctor—Vermont Marble Co.—two 2 motor single No. 1 beam cranes.

Wis., Milwaukee — A. O. Smith Corp., 27th St. and Keefe Ave.—heavy cranes.

Que., Montreal—E. E. Anderson, 28 Royal Ave.—400 cu.ft. compressor, steam or belt driven.

Que., Montreal—Pierre Cantin, 1428a Ave. de Hotel de Ville—mill lathe and drill press.

Que., Montreal—C. A. Cayouette & Sons, 248 D'Aragon St.—sander and buzz planer.

Que., Montreal—J. Rollc, 581 St. Timothee St. punch and shears for machine shop.

Cuba, Havana—Juan Pujol, Monte 278—turret lathes, automatic machines, bolt and nut forging machines, crucible furnaces, core ovens, etc., for proposed 52 x 140 ft. foundry and machine shop for the manufacture of all kinds of valves, plumber's fittings, etc.

Germany, Sobernheim, Rheinland—Carl Ewald (glues, leather, gelatine, etc., manufactures) is receiving bids from American manufacturers for automatic weighing and wrapping machines for small quantities of gelatine powder.

Opportunities for Future Business

Calif., Alameda—F. W. Smith & Son, Bay St., is having preliminary plans prepared for the construction of an organ factory. Estimated cost $40,000.

Calif., Berkeley—Steel Pipe & Tank Co., 1100 4th St., awarded contract for the construction of 1 story, 50 x 168 ft. plate storage building, 90 x 160 ft. rolling machinery and 120 x 250 ft. pipe construction building, on 4th St. $25,000.

Calif., Los Angeles—Peters & Crawford, 4012 West 10th St., has been granted permit for the construction of a 1 story, 24 x 50 ft. auto repair shop.

Calif., Martinez—Contra Costa County, has purchased site and plans the construction of repair shops and warehouse. R. R. Arnold, County Engr.

Calif., Richmond—A. C. Foote, 2022 Burbeck Ave., will build a machine and auto repair shop at 193 Espee Ave. Estimated cost $5,000.

Calif., Vernon—Percival Iron & Steel Co., 232 Allison St., Los Angeles, is having plans prepared for the construction of a machine shop on Santa Fe Ave., here. Estimated cost to exceed $100,000. Private plans.

Conn., Hartford—One Hundred Eighteenth Observation Squadron, Connecticut National Guard, is receiving bids for the construction of a 1 story armory including machine shop, etc., at Brainard Field. Estimated cost $60,000. Payne & Keefe, Manwaring Bldg., New London, Archts. Noted Oct. 22.

Conn., Waterbury—The Lux Clock Mfg. Co., 97 Sperry St., is having preliminary plans prepared for the construction of a 5 story factory unit. Estimated cost to exceed $40,000.

Ga., Atlanta — W. T. Candler, Candler Bldg., is having plans prepared for the construction of a 3 story, 200 x 253 ft. garage on Pryn St. Estimated cost $600,000. Ivey & Crook, Candler Bldg., Archts.

Ill., South Chicago (Chicago P. O.)—Valley Mould & Iron Corp., Sharpsville, Pa., awarded contract for the construction of a 1 story, 200 x 816 ft. factory at 3150-3158 East 108th St., here. Estimated cost $136,000.

Ill., Waukegan — James Morrows Sons, 202 North Genesee St., will soon award contract for the construction of a 2 story, 76 x 260 ft. repair and service garage. Estimated cost $200,000. C. N. Webster, 6 North Genesee St., Archt.

Ia., Council Bluffs—Union Pacific R.R., 1416 Dodge St., Omaha, Neb., awarded contract for the construction of a 2 story warehouse including locomotive and repair departments at 10th Ave. and 6th St. here. Estimated cost $45,000.

Mass., Brockton—R. Thompson, 42 Cottage St., plans the construction of a 1 story, 125 x 178 ft. repair and service garage at Main St. and Washburn Ave. Estimated cost $75,000. Architect not selected.

Mass., Brookline (Boston P. O.)—R. E. Snider, 18 Tremont St., Boston, will build a 1 story, 105 x 200 ft. repair and service garage at Lawton and New Sts., here. Estimated cost $80,000. C. N. Jacobs, 4 Park St., Boston, Archt.

Mass., Holyoke—K. R. Charlton Inc., 124 Suffolk St., is having preliminary plans prepared for the construction of a 1 story repair and service garage at Elm and Suffolk Sts. Estimated cost $50,000. G. P. B. Alderman & Co., 316 High St., Archts.

Mass., Fall River—Fall River Gas Works Co., 393 Madison Ave., is receiving bids for the construction of a 1 story, 55 x 110 ft. garage and repair shop. Stone & Webster Inc., 147 Milk St., Boston, Engrs.

Mass., Gardner—S. Bajonski, c/o A. J. Smith, 142 Lunenberg St., Fitchburg, Archt., awarded contract for the construction of a 55 x 100 ft. garage at Corner St. and City Hall Ave. Estimated cost $85,000. Noted Oct. 1.

Mass., Pittsfield—F. T. Francis, Mayor, awarded contract for the construction of a 1 story repair and service municipal garage. Noted Oct. 15.

Mass., Westfield—S. Simkowitz, 240 Elm St., awarded contract for the construction of a 1 story, 40 x 105 ft., repair garage. Estimated cost $40,000.

Mass., Westfield—H. B. Smith Co., 640 Main St., Cambridge, awarded contract for the construction of a 1 story machine shop. Estimated cost $40,000. Noted Oct. 22.

Mass., Woburn—Woburn Realty Co., c/o S. Epstein, 262 Washington St., Boston, is receiving bids for the construction of a 1 story, 50 x 200 ft. repair and service garage on Federal St., here. Estimated cost $45,000. S. S. Levy, 35 Court St., Architect.

Mich., Menominee—Menominee Lumber & Cedar Co., North State St., plans the construction of a lathe and shingle mill to replace fire loss. Estimated cost $25,000. Architect not selected.

Mo., Kansas City — J. H. White, c/o White Hotel, awarded contract for the construction of a 4 story, 115 x 184 ft. garage and office building at 1226 McGee St. Estimated cost $200,000.

Mo., North Kansas City—R. W. Yates Laundry Machinery Co., 1210 West 9th St., Kansas City, will build a 1 story, 145 x 150 ft. machine shop at 10th and Cherry Sts. here. Estimated cost $45,000. C. B. Sloan, 321 East 11th St., Kansas City, Archt. G. O. Martin, Supt. of construction.

Mo., St. Louis—Bd. of Public Service, 208 City Hall, will soon receive bids for the construction of a 3 story power service station, repair shops, etc., on Clark Ave. Estimated cost $1,000,000. Study & Farrar, Arcade Bldg., Archts.

Mo., Sedalia—Missouri Pacific Ry. Co., Railway Exchange, St. Louis, has appropriated $146,000 for the construction of a reclamation plant at shops here. E. A. Hadley, St. Louis, Ch. Engr.

N. Y., Buffalo—Elmwood Pattern Works, 1934 Elmwood Ave., plans the construction of a factory for the manufacture of wood patterns and models at 277 Hinman Ave. Estimated cost $25,000.

N. Y., Buffalo — G. W. Pfohle Jr., 61 Peckham St., plans the construction of a factory for the manufacture of auto bodies on Main St. Estimated cost $30,000.

N. Y., Buffalo—F. M. Rich, 94 Parkwood Ave., Kenmore, plans the construction of a factory for assembling addressing machine and making paper stencils on Chenango St. here. Estimated cost $30,000.

N. Y., New York—Southwest Co., c/o Moore & Landseidel, 148th St., and 3rd Ave., Archts., is having plans prepared for the construction of a 5 story, 180 x 180 ft. garage at Fordham Road and Lorillard Place. Estimated cost $65,000.

N. Y., Tarnesda—Rudolph Wurlitzer Mfg. Co., Niagara Falls Blvd., awarded contract for the construction of addition to factory for the manufacture of musical instruments. $300,000.

Ore., Portland — Auto Hotels Corp., Los Angeles, Calif., is having plans prepared for the construction of a 6 to 8 story, 100 x 100 ft. auto storage building and garage here. Estimated cost $150,000 to $200,000. Hurley Mason Co., Gasco Bldg., Archt.

O., Marietta—Marietta Safe Cabinet Co., awarded contract for the construction of a 4 story, 60 x 510 ft. factory and 3 story, 60 x 225 ft. office building. Estimated cost $500,000. Noted Oct. 22.

Okla., Muskogee — Continental Oil Co., Continental Oil Bldg., Denver, Colo., plans the construction of a garage, distributing plant and office building here. Estimated cost $400,000.

Okla., Oklahoma City—J. B. Klein Iron & Foundry Co., 1006 West 2nd St., will build a 1 story, 75 x 125 ft. foundry building. Estimated cost $10,000. Private plans.

Va., Staunton—J. L. Witz Furniture Corp., is building a 160 x 700 ft. furniture factory. Lockwood, Greene & Co., 1 Pershing Sq., New York, N. Y., Engrs.

Wis., DePere — Hudson Mfg. Co., E. Abendroth, Mgr., Main St., will soon receive bids for the construction of a 2 story, 62 x 120 ft. factory for the manufacture of dairy barn equipment, ventilators, etc. Estimated cost $75,000. Private plans. Noted Oct. 8.

Wis., Milwaukee—Oneida & Jackson Co., c/o A. Straus, 230 Grand Ave., awarded contract for the construction of a 3 story, 100 x 122 ft. garage at Oneida and Jackson Sts. Estimated cost $150,000.

Wis., Milwaukee—A. O. Smith Corp., 27th St. and Keefe Ave., awarded contract for the construction of a 1 story, 152 x 560 ft. plant for the manufacture of pressed steel products on Keefe Ave.

Wis., Two Rivers—Aluminum Goods Mfg. Co., 15th and Franklin Sts., Manitowoc, awarded contract for the construction of a 5 story, 137 x 148 ft. manufacturing building here. Estimated cost $250,000. Noted Oct. 22.